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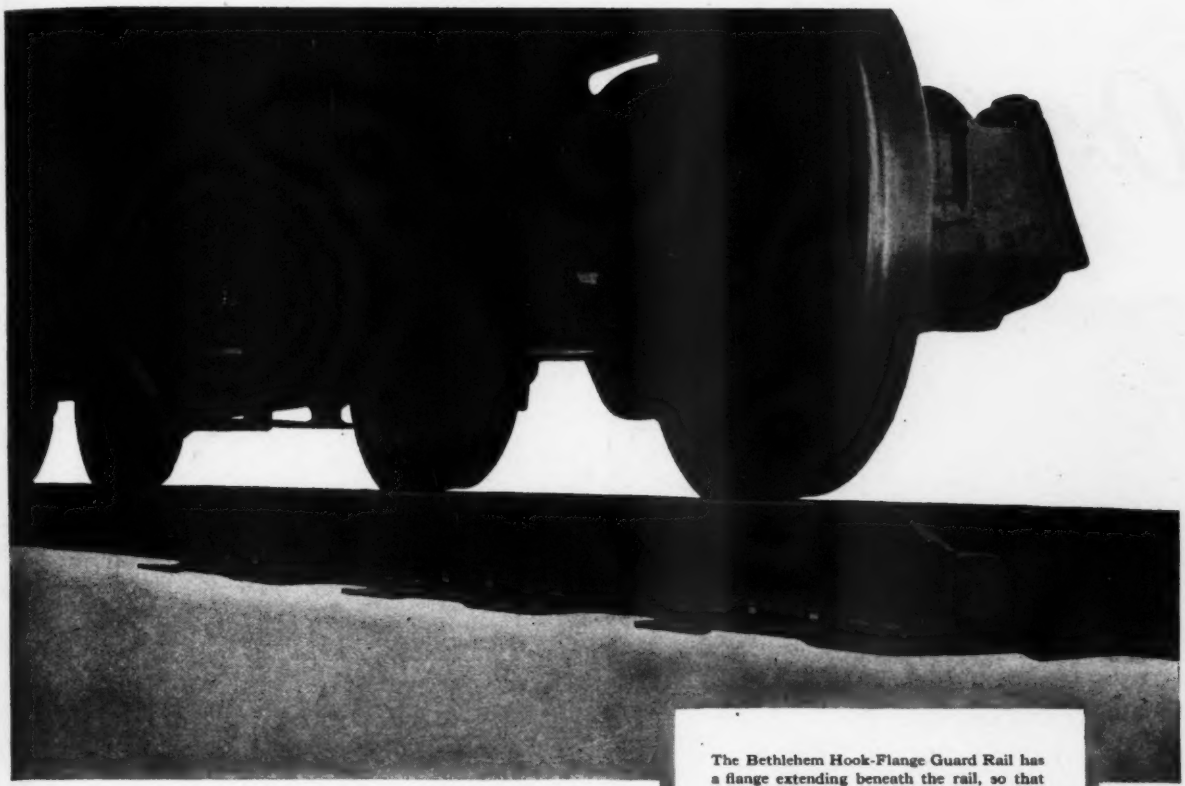


The Bethlehem Hook-Flange Guard Rail has a flange extending beneath the rail, so that the weight of the train on the rail holds the guard rail securely in place, regardless of the side thrust against it.

Weight of the train keeps guard rail from overturning

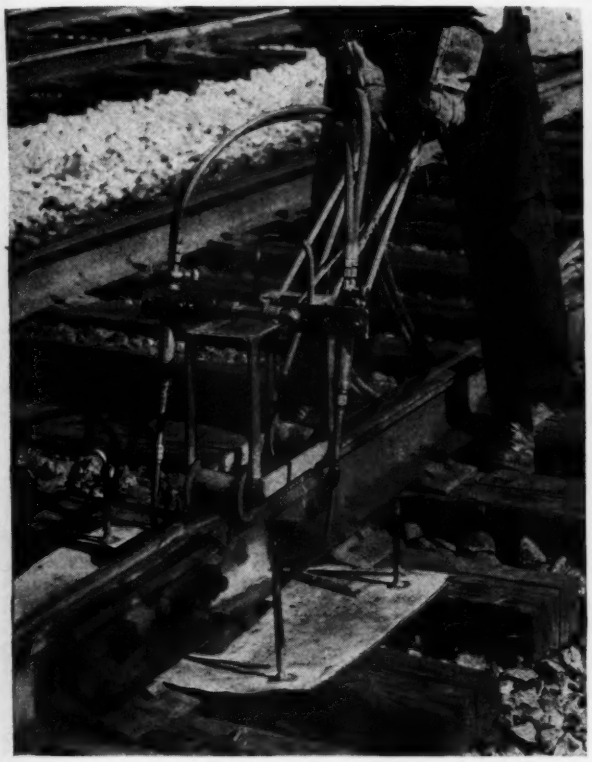
While Bethlehem Hook-Flange Guard Rails are a sound selection in any year and season, right now they are needed more than ever. Trackwork is carrying the heaviest loads in railroad history. Every switch, every rail, every guard rail must do its part to keep war traffic rolling. And the Bethlehem Hook-Flange Guard Rail can be counted on to do just that. That's because this Bethlehem guard rail is made tough and resilient. There is no record of one ever having failed in service. Furthermore, this guard rail provides extra security for war traffic because its special hook-flange design directly utilizes the weight of the train to prevent overturning.

Another feature of this guard rail is that the design permits dissipation of impacts and absorbs shocks. It eases fast-moving wheels into line without shock and jolt, holding guard rail maintenance costs down and avoiding the danger of cracking or chipping wheels.

Look into the advantages of specifying Bethlehem Hook-Flange Guard Rails—on high-speed track, in classification yards, and in terminals. It's made for all weights and types of track, in any length required.

BETHLEHEM BETHLEHEM STEEL **HOOK-FLANGE GUARD RAIL**

critical supplies



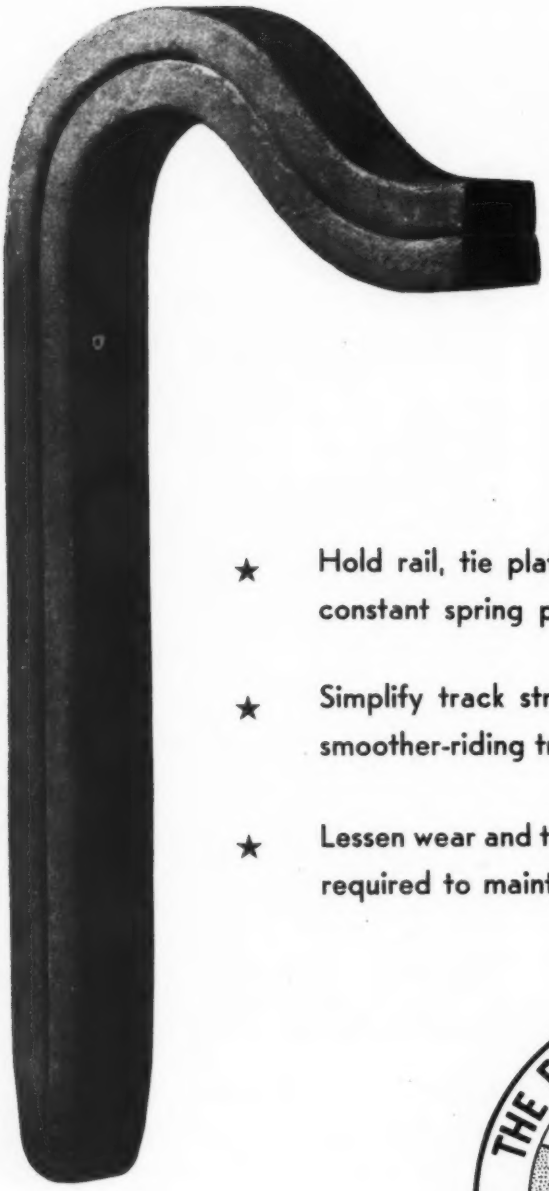
FLAME-STRAIGHTENING OF JOINT BARS

Worn joint bars permit sag at rail joints and intensify the effects of end batter. Flame-straightening of worn bars in track prolongs their life, provides a more nearly true riding surface, and cuts down the amount of welding rod required for building up rail ends. Oxweld's semi-mechanized method requires only one operator.

BUILDING UP RAIL ENDS

The Oxweld method for building up rail ends saves rail replacements now, when steel mill output is so greatly needed for other uses. A few ounces of Oxweld MW welding rod, applied by oxy-acetylene welding, will restore both ends of a 39-ft., 112-lb. rail, thus keeping 1,456 lb. of rail at work in original position.

BONDS AND STAMPS



Elastic RAIL SPIKES

★ Hold rail, tie plate and tie firmly together under constant spring pressure, reducing rail creepage.

★ Simplify track structure and provide quieter and smoother-riding track.

★ Lessen wear and tear on ties and reduce track labor required to maintain gage, line and surface.

MEMBER
TRACK SUPPLY ASSOCIATION TSA

ELASTIC RAIL SPIKE CORPORATION

Affiliate of Bernuth, Lembcke Co., Inc.

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TECO CONNECTORS
and the services
that go with them
TECO Design Service
Teco has available for distribution to architects and engineers complete data on all phases of timber design, including tables and charts on timber beams, columns, floors, connector loads, bolt loads, stresses, etc.
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Teco maintains a staff of engineers to consult with architects and engineers on their design problems. Teco Connector distributors and fabricators in all parts of the country also render helpful services to architects and engineers.
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TECO Research Service
Teco conducts a continuous research program as well as sponsoring research at outstanding engineering colleges and laboratories to increase the design knowledge of timber designers. The benefits and results of this research are passed on to interested individuals in the form of design data and improved products.
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Specify Them!

FOR TAMPING

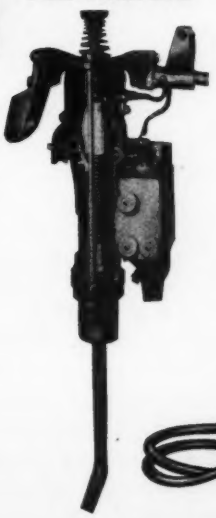
FOR CRIBBING

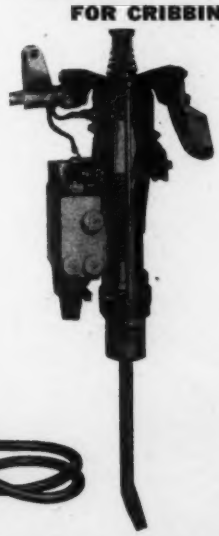
BARCO TYTAMPERS

With 1943 railroad traffic already exceeding the peak traffic of 1942, it is today more than ever essential to help protect rail life by spot tamping joints and otherwise keeping the ballast in suitable condition.

Barco Unit Tytampers being self-contained and easily carried by one man allow more time on the job, maximum production with resultant cost reduction and well tamped track that retains surface and alignment longer.

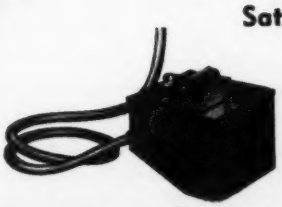
Maintaining track by tamping low spots is much more economical and satisfactory than repairing track that has been neglected. Barco Tytampers are suitable for spot tamping or gang tamping.





Now Used by 91 Railroads

Eight Years of Satisfactory Service



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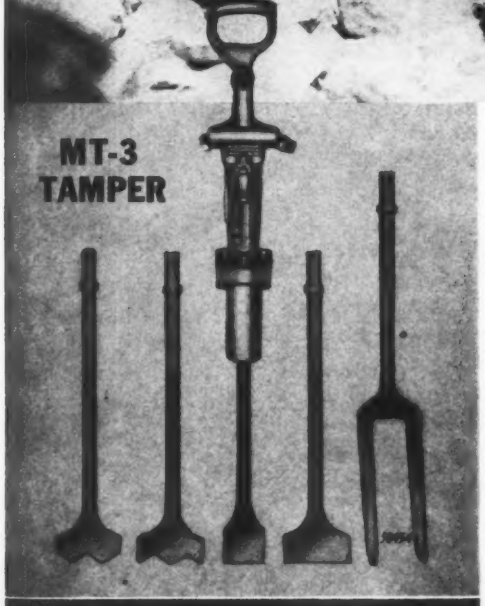


I-R Spottamper Compressor operating four MT-3 Tie Tampers.

MECHANICAL TAMPING
SAVES TIES, TIME AND MEN

Pneumatic tie tampers do not sliver the ties, and the ballast is not struck a crushing blow as when a hand tamping bar is used. Instead, the mechanical tamper keeps the bar in contact with the ballast only, and a series of blows on the shank end of the bar produces a shoving effect that pushes the ballast into its proper place under the center of the tie.

Because pneumatic tie tampers operate at a uniform air pressure, they strike uniform blows, thus producing a smoother and safer track. It is impossible to obtain the same results by hand tamping, since the physical strength and endurance of the men in the tamping crew may vary greatly. Furthermore, air tampers greatly reduce the fatigue element; the operators find them easy to handle because they merely have to guide the tool while tamping.

Four men with pneumatic tie tampers will tamp as much track as twelve or fourteen men with hand tools. The roadbed will be in better condition and will stand up under heavy traffic over a longer period of time. This is especially important *now*, because track maintained with mechanical tampers will move war loads *faster*.

Ingersoll-Rand
11 Broadway, New York, N. Y.

11-313

ORIGINATOR OF MECHANICAL TAMPING

HOW AND WHY

WILLIAMS' TOOLS AID WAR PRODUCTION

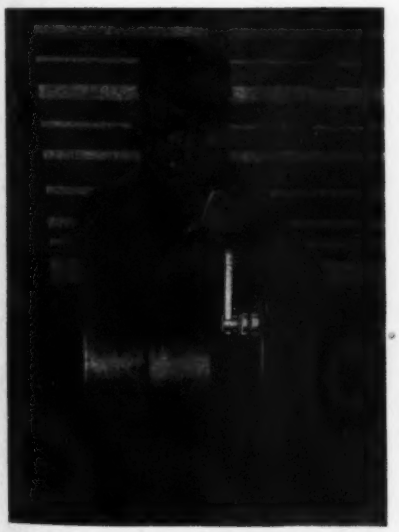
J. H. WILLIAMS & CO., *Drop-Forgings and Drop-Forged Tools*, BUFFALO, N. Y.

SPEED. Much time is saved on this machine assembly job with this "Supersocket" combination. The operator quickly tightens a long row of cap screws while standing erect. Wrench assembly consists of S15P Speeder Handle, S110P Extension Bar and Socket.

SAVING TIME WITH "SUPERSOCKETS"

● Detachable Socket Wrenches offer two inherent advantages which should not be overlooked today. Because of their basic design which provides for the assembling of the various components, Williams' "Supersockets" permit the user to *assemble* what amounts to a special wrench for the particular job at hand. Thus a *faster*, and often *safer*, wrench is provided as shown in the several Socket Wrench applications illustrated. Vital man-hours can be saved on many manufacturing, maintenance and repair operations by the use of a suitable "Supersocket" combination.

OBSTRUCTIONS like this would present quite a problem for any other type of wrench, and would undoubtedly require removal of the bracket in the foreground. Wrench assembly consists of S51 Ratchet and Socket. This Ratchet will permit rotation of the nut when handle swing is limited to as little as 30°.



SAFETY. A slip of the wrench could be serious for this millwright working on an overhead lineshaft. His "Supersocket" Wrench not only gets to an awkwardly-placed nut but, in completely encasing it, makes slippage practically impossible. Wrench assembly consists of S20A Sliding T Handle and Socket.

A FEW TYPICAL HANDLES & PARTS

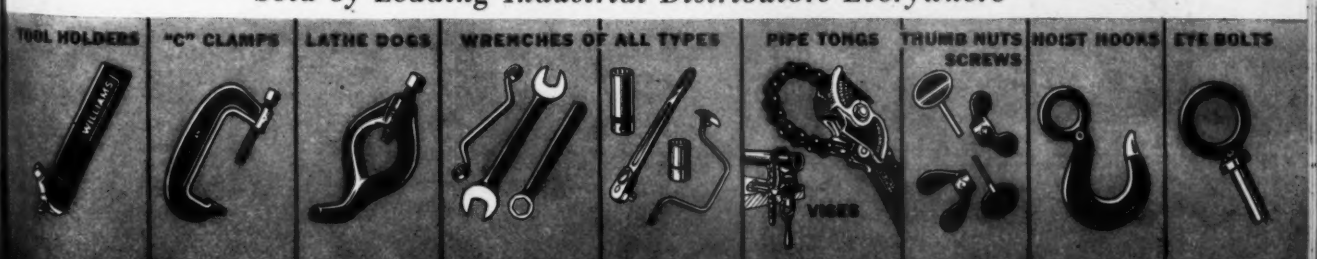
A FEW TYPES OF SOCKETS

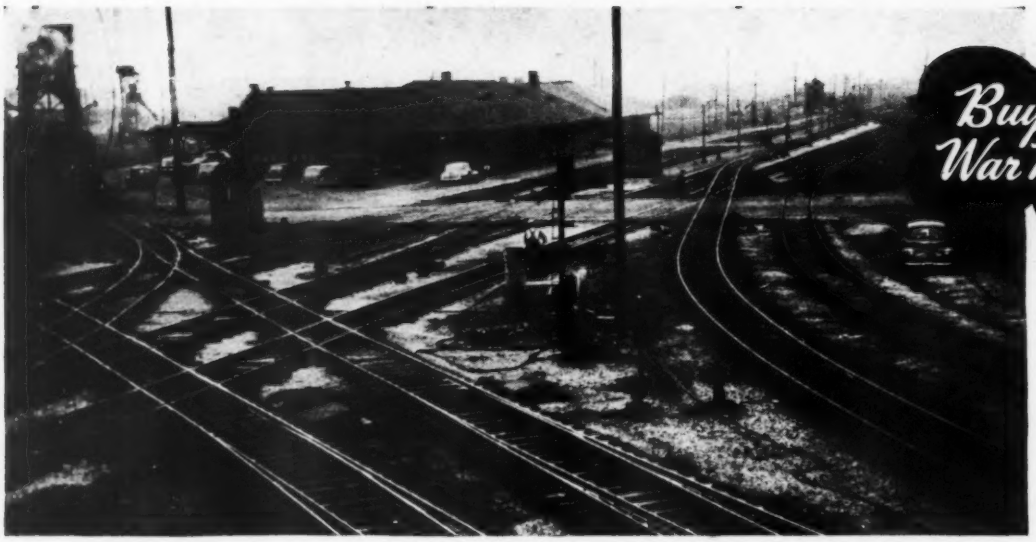
Williams' "Supersockets" are made in 5 patterns. Sold singly and in complete sets.

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
Headquarters
for over half a century of
DROP-FORGINGS and DROP-FORGED TOOLS

HARD-TO-REACH places are "duck soup" for "Supersockets." This workman will save a lot of time that otherwise would be consumed in disassembling the machine in order to reach the particular bolt that needs tightening. Wrench assembly consists of S15P Speeder Handle, S115P Extension Bar and Socket.

Sold by Leading Industrial Distributors Everywhere





This entire track area, used by five trunk line railroads with 700 train movements daily, was pressure grouted with no interruption to trains.

PRESSURE GROUTING

saves wartime track labor

Engineers of major railroads who have tried pressure grouting of subgrades under main-line track, report saving thousands of man-hours of maintenance labor urgently needed for other work.

Portland cement grout forced into water pockets and soft subgrade checks maintenance troubles caused by "mushy" tracks. Pressure grouting stiffens the subgrade, prevents surge action of water, changes water pockets into load-spreading slabs, and helps keep track in line and grade.

One chief engineer reported saving 4,536 man-hours of track labor in 36 weeks by pressure grouting operations on 1,571 track feet. Another reduced track maintenance by 82 per cent by treating five water pockets under high-speed main-line traffic.

Pressure grouting is done with regular section gangs without interruption to traffic.

Our engineers have developed valuable experience regarding grouting under field conditions. Let us show you how pressure grouting can solve track maintenance problems.

PORTLAND CEMENT ASSOCIATION

Dept. A10-27, 33 W. Grand Ave., Chicago 10, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

Above—Trains move while workman is observing penetration of grout under track at 80 p.s.i.
Left—Installing grout point reaching into subgrade below track.

Rebirth of a Locomotive

IRON HORSES haul the major load of war production. They must keep rolling. Time out must be held to a minimum.

Above you see a "welder" engaged in washing out rivets to remove worn or damaged parts . . . an essential step to the rebirth of a locomotive. Railroads employ this modern tool for numerous other jobs . . . to shape-cut new metal parts quickly and accurately; to flame harden metal surfaces for resistance to wear; to build up worn rails; to flame clean bridges and other steel structures . . .

As with the railroads, so wherever man works with metal, the oxyacetylene flame and its companion, the electric arc, make possible faster and better ways of fabrication and upkeep.

Through constant improvement in the use of these modern "tools", Airco research is broadening their service to industry. Whether it be for maintenance or production, Air Reduction engineers will assist you in the application of the oxyacetylene flame and electric arc.

★ BUY UNITED STATES WAR BONDS ★

AIRCO WILSON

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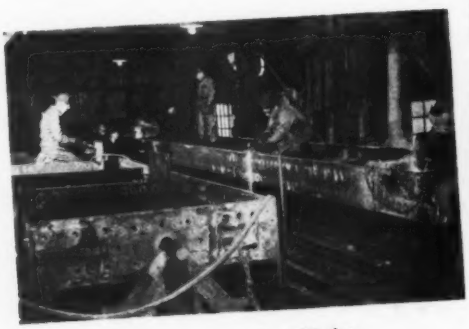
MEMBER

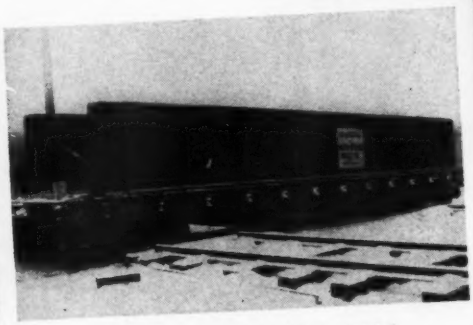
NEW METHODS *to Help the Railroads Serve and Save!*

NEW BRIDGES *from Used Structures*

Through abandonments, many structurally sound steel spans, singly or in combination, can be adapted by refabrication for use elsewhere to meet load capacities and new locations. Deep girders can be reduced in depth, low girders can be expanded. It is possible to redesign structures to fit new locations through electric welding with a minimum of new steel, at a considerable saving in cost, and without delay.



Shop method of positioning work on trunions for welding.



Assembled and painted bridge, loaded for shipment and ready for installation.

HERE IS A TYPICAL MORRISON REFABRICATING JOB

For a leading trunk line railroad, Morrison refabricated 54 spans without the use of a single pound of new structural steel. In the Morrison "refabrication shop" 51 foot girders were cut down to 41 foot lengths. Cut-offs and cross girders were utilized to fabricate stiffener, bearing, end-facing, sole and apron plates, as well as gussets, etc. All assembly was done by arc welding and the finished spans painted and shipped, ready for installation.

For Details WRITE *or* CALL

Serving America's Vital Transport!

MORRISON METALWELD PROCESS *Inc.*

A SUBSIDIARY OF MORRISON RAILWAY SUPPLY CORP.

1437 BAILEY AVE.
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Fast, Strong Foundations for American Industry at War

MONOTUBES..

FOR years, job-wise engineers and construction men have preferred Union Metal tapered Monotubes for the fast, sure, easy and economical installation of cast-in-place concrete piling.

Monotubes have been used successfully in the construction of bridges, buildings, highways and underpasses in 34 States of the Union and in foreign countries.

Today, because we, like you, are devoting all of our efforts to the Nation's drive for victory, Monotubes are produced only for the construction of war plants and other essential war projects.

But tomorrow, when the victory is ours, Monotubes once again will be available to everyone in any quantity —for sounder, more lasting foundations.

Remember these special Monotube features if you're building for war production *today,* or planning peacetime projects for *tomorrow:*

SPEEDY Handling. Monotube steel casings are light in weight for fast and economical handling.

SPEEDY Driving. Tapered Monotubes are so strong and rigid they require no heavy core or mandrel and can be driven with average job equipment.

SPEEDY Extension. Extendible Monotubes permit installation of varying pile lengths on the job without delay or waste, even in low headroom.

SPEEDY Inspection. Tubular design permits fast, thorough inspection, top to toe, before concreting.

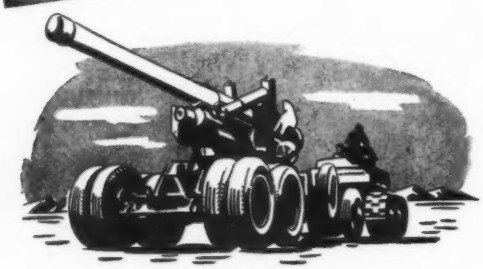
Available in a gauge, size and taper to meet all requirements. Catalog 68A, free on request, gives complete details. Write for your copy.

ARMY (E) NAVY

UNION METAL

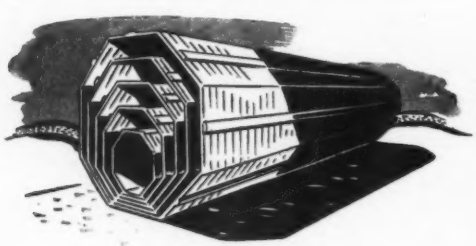
THE UNION METAL MANUFACTURING COMPANY • ***Canton, Ohio***

CONSIDER THIS . . BEFORE YOU USE Steel for Drainage

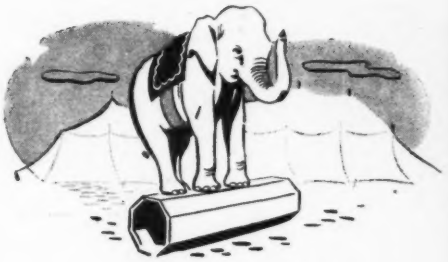


Our fighting forces during the last 6 months of 1943 need 2 million tons of steel *more* than the rated capacity of all the steel mills in the country for this period. It's a big order, but with your help it can be done. American lives can be saved and the war shortened.

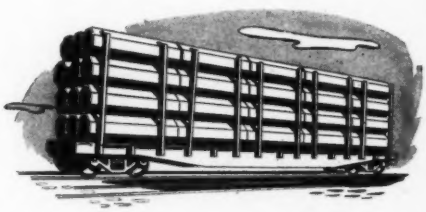
How? By asking yourself this before using steel in any form: *"Is it being used to the best advantage of the war effort, or can I find a suitable substitute?"*



For example, take ARMCO Emergency Pipe—an all-wood pipe developed by a steel company especially to save steel for vital war needs. It requires no steel sheets and bands or reinforcing steel. Every time you use it you are contributing to the 2 million additional tons we must have before 1944.



ARMCO Emergency Wood Pipe is amply strong, though light in weight and nestable. This frequently means up to 80 per cent savings in transportation costs. Unskilled labor can install it easily.



Help conserve needed steel by using ARMCO Emergency Pipe wherever you can. There are ample stocks in various parts of the country for speedy delivery. This way you can be sure that drainage during this period will be taken care of economically, efficiently and, most important, *patriotically*. Write to us for complete information. Armco Railroad Sales Co. Inc., 2611 Curtis St., Middletown, Ohio.

ARMCO

ARMCO EMERGENCY PIPE

THE NATONAL ROAD . . . Originally known as the Cumberland Road, the National Road was the first government financed highway project in the United States. Authorized by Congress, construction started in 1808 — completed in 1852. The roa extended from Cumberland, Maryland, through the Alleghenies to Wheeling, Virginia (now West Virginia), on to Zanesville

ROADBEDS . . . *Supporters of Progress*

Credit for Ancient Rome's domination of Gaul and Britain goes to their well-disciplined Legions. History acclaims those swiftly moving cohorts. But, the secret of their successful marches and countermarches lay in the splendid roads they built and maintained in the conquered areas. Napoleon, too, knew the value of good roads during his ascendant years.

American civilization was a thin fringe along the Atlantic seaboard until good roads began to be built inland. The first government financed road project—the Cumberland Road, extending from Cumberland west through the Alleghenies—made possible the rapid development of the vast and rich lands drained by the Ohio and Mississippi Rivers.

The development and maintenance of good roads is the history of man's progress and civilization.

What is true of roads is true of Railway roadbeds—the arteries of America's most vital system of transportation. As crude steam wagons gave way to improved engines, roadbeds must needs follow in perfection, that invention might be successfully exploited. Throngs might thrill and cheer the marching soldiers or the belching locomotive, but the good foundations on which they traveled gave them the unobstructed way to progress.

Today, as the great Railway Systems of the United States, developed by private enterprise, shatter all pre-

OF ALL THE CARS IN SERVICE TODAY

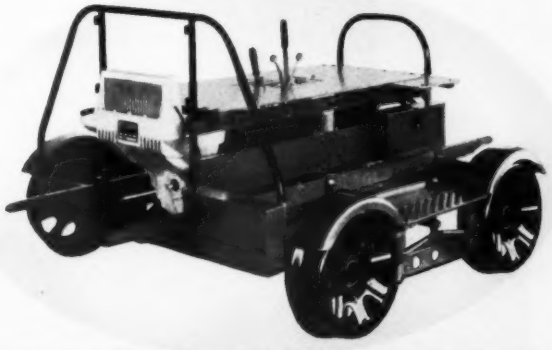
Columbus, Springfield, Ohio; Indianapolis and Terre Haute, Indiana, and terminated at Vandalia, Illinois — more than 600 miles, of which 270 miles lay across the Alleghenies. This highway was 60 feet wide and had a three-foot solid rock foundation. The maintenance of this roadbed ran into millions of dollars annually — a fabulous sum in those days.

vious records for the movement of men and materials, due credit should be given the loyal and efficient maintenance crews, whose vigilant care safeguards the thundering passage of these champions of freedom. To supply these maintenance crews with swift dependable railway motor cars is Fairmont's task—a responsibility we take deep pride in having fulfilled successfully.

Fairmont MEMBER ISP

RAILWAY MOTOR CARS

Performance ON THE JOB COUNTS



M 19 Series E—1-4 man car. Extension lift only 95 lbs. Spring mounted chassis for smooth riding. 5-8 H.P. R O Hy-Load Roller Bearing Engine for ample reserve power. Bulletin 396.

. MORE THAN HALF ARE FAIRMONTS

DUFF-NORTON

TRACK JACKS

—Speed your track maintenance

—Stretch your manpower

Easy to operate—absolutely safe—sturdy enough for the toughest service—Duff-Norton Track Jacks help your men speed track maintenance work.

With Duff-Norton Track Jacks on the job your Rolling Stock rolls smoothly over well-kept road bed. Write for descriptive literature.

THE DUFF-NORTON MANUFACTURING CO.

PITTSBURGH, PA.

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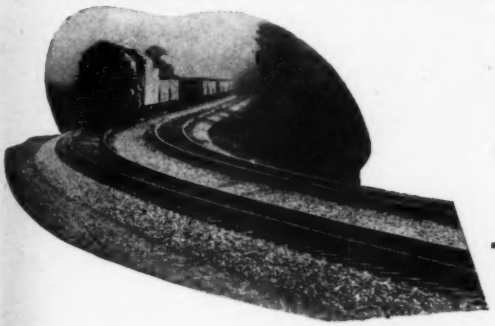
To hold the GAGE . . .



—on stiff curves

—at main switches

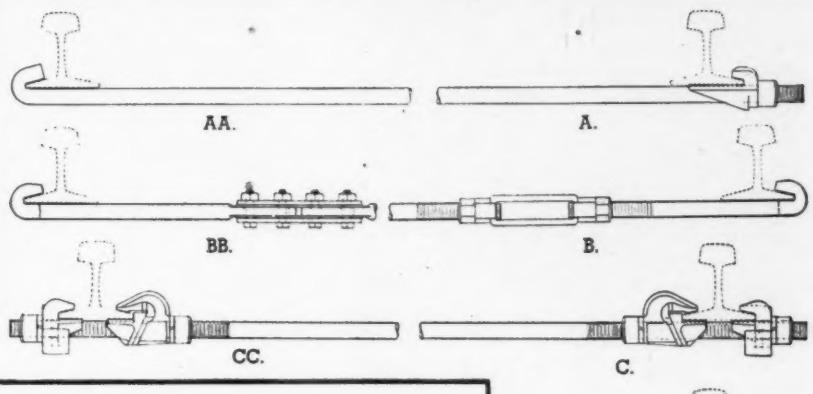
—near railroad crossings

use OLIVER GAGE RODS

Available in various types as indicated by the drawings at the right, Oliver Gage Rods put an end to many of the damaging effects to rails and ties of heavy, high speed traffic. They enable you to maintain accurate gage at switches, curves and turnouts by anchoring both rails together in a single thrust and load-sharing unit. This equalized distribution of loads reduces the crushing effect of lateral thrust on outside rails; ends mechanical destruction of ties caused by loosening of spikes and shifting of tie plates; makes frequent regaging unnecessary; prevents damage to ties through excessive spiking.

Oliver Gage Rods have been developed through years of close association with railroad problems. Made from 1¼" diameter hot rolled open hearth steel, they are furnished with either bent or drop forged rail hooks with adjusting screws, and insulation if desired.

Write for complete data.



OLIVER GAGE RODS TYPES AND RAIL JAWS

AA. Non-Insulated Type
BB. Center Insulated Type.
CC. Double End Type.

A. Rail Jaw No. 10.
For average conditions. Light. Economical.

B. Rail Jaw No. 60.
Turnbuckle. For center adjustment.

C. Rail Jaw No. 50.
Wedge grip with anti-creeper to resist tilt and rail creep.

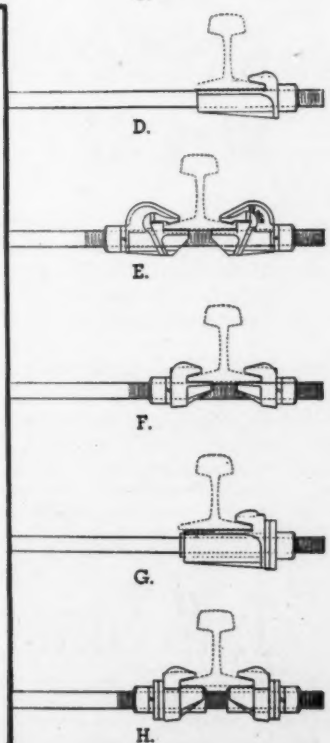
D. Rail Jaw No. 20.
Wide rail-base seat.
For heavier than average service.

E. Rail Jaw No. 30.
Double wedge grip.
Resists rail tilt.
For extreme service conditions.

F. Rail Jaw No. 40.
Vise action resists rail tilt.
Prevents rod slippage along rail base.

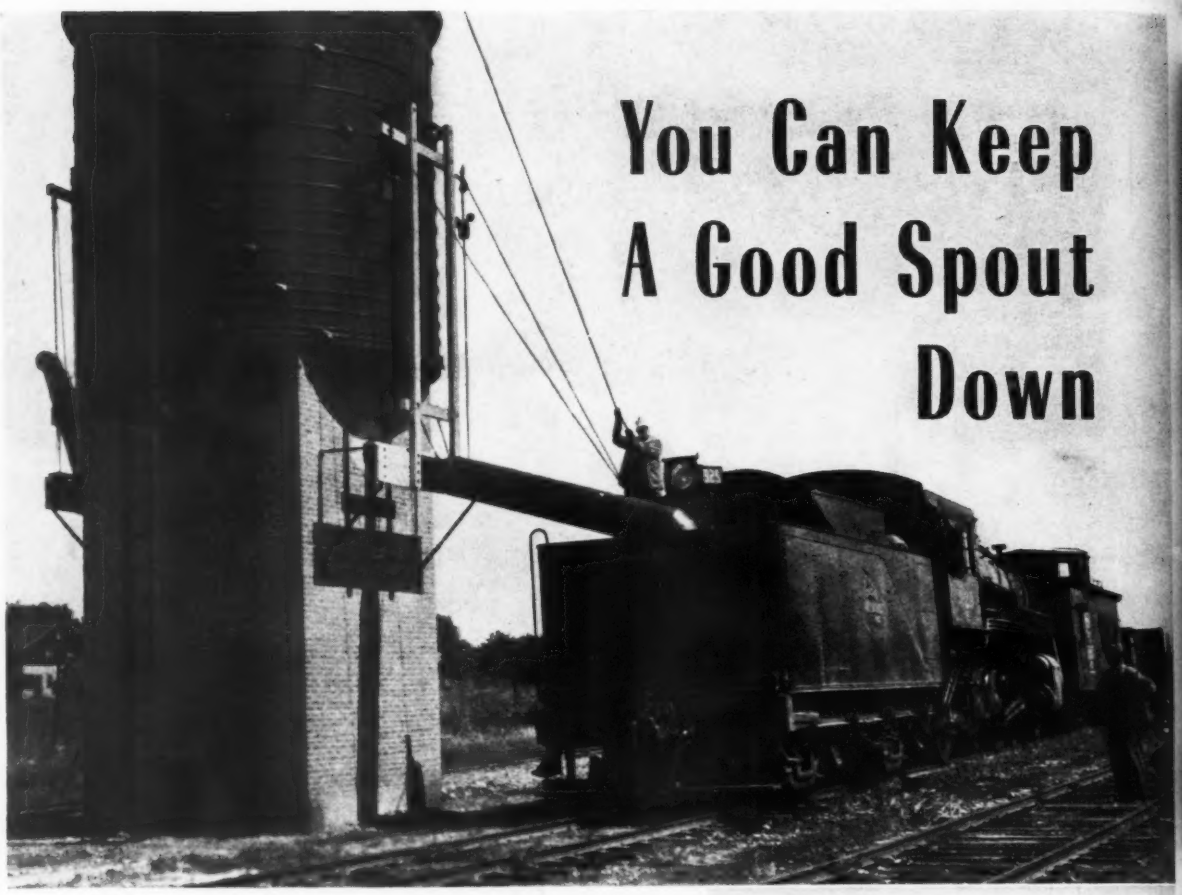
G. Rail Jaw No. 70.
End insulated with heavy, water-repellent fibre insulating material.

H. Rail Jaw No. 80.
Combines end insulation with clamp action of Rail Jaw No. 40.
Employs hard fibre insulating sleeves.



OLIVER
IRON AND STEEL
Corporation

PITTSBURGH · PENNSYLVANIA



You Can Keep A Good Spout Down

SNOWCO Water Spouts Stay SET For Delivery

The SNOWCO scientifically stabilized water spout, counterweighted for one-man operation, will remain stationary in the full delivery position without manual aid, thus practically eliminating the hazard of injury from spout kicking out of manhole.

As illustrated SNOWCO Stabilized Water Spouts can be installed in Redwood Tanks as well as in your existing steel tanks.

Other desirable features of this new spout include fully enclosed frost-proof discharge valve mechanism, which insures unrestricted operation in winter and also reduces possible maintenance expense to a minimum.

T. W. Snow Construction Co.

9 So. Clinton Street Chicago, Ill.

5-Brute Team Helps The Section Boss

BOSSING a gang of rust eaters these days means getting *more* work from *fewer* men, to keep those wartime stingers highballing to the fighting fronts.

Teamwork is what you need. You get just that with Worthington Blue Brute Hand-i-air Compressors powering four WTT-7 Tie Tampers.

Light, easily handled, quickly spotted and moved, these "hurricanes on wheels" deliver 60 cubic feet per minute — just right for the job.

Other Blue Brute compressors . . . portable, semi-portable, Diesel or electric-driven . . . also mean more air delivered per compressor dollar. Team 'em up with Blue Brute Rock Drills and Air Tools . . . like these rugged Tie Tampers . . . *for more work done per tool* — per gang!

*Blue Brute Compressors and Air Tools are painted olive drab for the Army and battleship gray for the Navy.

Behind the Fighting Fronts with

BLUE BRUTES

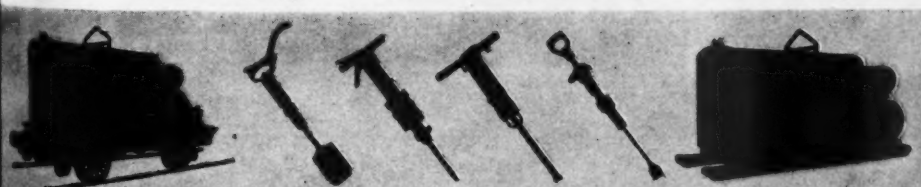
When crowded schedules cut down working time and road beds must be right, Blue Brute Portable Compressors and Air Tools make every minute count. Blue Brutes in "uniforms" of olive drab or battleship gray* are also serving in hundreds of Army camps, Navy yards, air bases and ordnance plants.

Get more WORTH from air with WORTHINGTON

MEMBER

BUY BLUE BRUTES

THE TRACK SUPPLY ASSOCIATION TSA

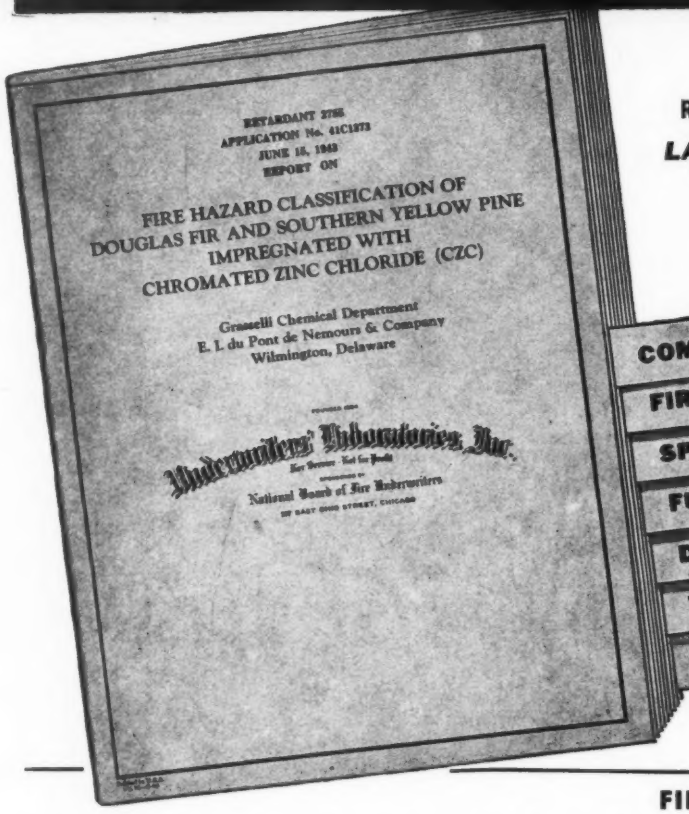


Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs. Rock Drills and Air Tools that have always set the pace for easy operation — available in a wide range of weights and sizes.

WORTHINGTON

Worthington Pump and Machinery Corporation Harrison, N. J. Holyoke Compressor and Air Tool Department, Holyoke, Massachusetts

Now you can get all the facts on the FIRE-RESISTANCE OF "CZC"-TREATED WOOD


RETARDANT 2788
APPLICATION No. 41C1273
JUNE 15, 1943
REPORT ON

FIRE HAZARD CLASSIFICATION OF DOUGLAS FIR AND SOUTHERN YELLOW PINE IMPREGNATED WITH CHROMATED ZINC CHLORIDE (CZC)

Grasselli Chemical Department
E. I. du Pont de Nemours & Company
Wilmington, Delaware

Underwriters' Laboratories, Inc.
For Service - Not for Profit
National Board of Fire Underwriters
207 EAST OHIO STREET, CHICAGO

NEW AUTHORITATIVE 64-PAGE REPORT ISSUED BY *UNDERWRITERS' LABORATORIES, INC.*, GIVES DETAILED ANSWERS TO THESE QUESTIONS ABOUT "CZC"-TREATED WOOD:

- COMBUSTIBILITY
- FIRE RETARDANT RATINGS
- SPREAD OF FIRE
- FUEL CONTRIBUTED
- DENSITY OF SMOKE
- TOXICITY OF FUMES
- DEGREE OF PERMANENCE

This chart shows the resistance provided by varying amounts of "CZC" in treated wood. Untreated wood is rated 100. Incombustible asbestos-cement board is rated 0.

FIRE HAZARD CLASSIFICATION

Factors	Retention of Dry Salts Per Cu. Ft.			
	1 lb.	2 lbs.	3 lbs.	4 lbs.
Flame spread	60	40	35	30
Fuel contributed	50	35	30	25
Smoke developed	Less than with untreated lumber.			

• This report gives you distinctly useful information—new facts valuable in designing construction projects. Send for your copy today. E. I. du Pont de Nemours & Co. (Inc.), Grasselli Chemicals Department, Wilmington, Delaware.

DU PONT REG. U.S. PAT. OFF. **CZC**

CHROMATED ZINC CHLORIDE

WOOD PRESERVATIVE

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

BACK THE ATTACK WITH WAR BONDS

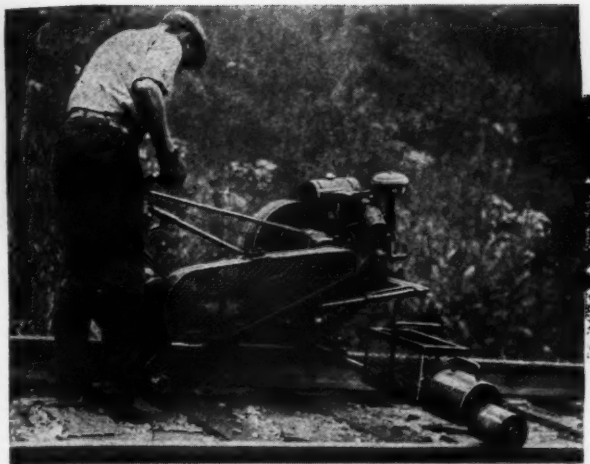
E. I. du Pont de Nemours & Co. (Inc.),
Grasselli Chemicals Department
5017 Du Pont Bldg., Wilmington 98, Delaware

Please send me the Underwriters' Laboratories, Inc. report on "CZC"-treated wood.

*Name*_____

*Address*_____

*City*_____ *State*_____



Nuts are removed from the old rail and uniformly tightened on the new rail. Two Nordberg Power Wrenches are used on this rail laying job.

Three men and this Nordberg Spike Puller pulling all spikes, make faster progress possible.

Nordberg Equipped Rail Laying Gang Helps Solve The Manpower Problem

Even though faced with a shortage of manpower, essential track maintenance can be accomplished with the aid of Nordberg Power Tools. The illustrations are of a small rail laying gang of about 50 men. The time and labor saved by the six Nordberg tools on this job is typical of how Nordberg equipment is helping solve the manpower problem and keeping track properly maintained to meet the demands occasioned by wartime traffic.

NORDBERG POWER TOOLS

Adzing Machine	Spike Puller
Track Wrench	Rail Drill
Power Jack	Rail Grinders

A tough tie adzing job made easy, uniform tie seats provided and better track attained with these two Nordberg Adzing Machines.

Many man hours were saved at switches with the use of Nordberg Rail Drill. This machine is especially adapted for operating in confined locations.

NORDBERG MACHINERY

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

Export Representative—WONHAM Inc.—44 Whitehall St., New York

Trains move on schedule while this powerful 2-cycle Diesel tractor and bulldozer widens ditches and builds up your road bed — no interference in any way with traffic. It is handy, too, for clearing work — uprooting trees, stumps, boulders and hauling them away.

You can handle any regular cut-and-fill work or haul dirt from a borrow pit with a 2-wheel scraper added to your 2-cycle Diesel tractor and 'dozer. Rear-dumps . . . on the level or up the slope. Works free of the track at all times.

For numerous grading, maintenance and loading operations, this tractor-shovel is the ideal unit. No end to its uses — building up slopes, widening ditches, carrying ballast to road beds or loading material into trucks.

"OFF-TRACK" MAINTENANCE EQUIPMENT KEEPS WAR TRAVEL MOVING

You can keep the heavy loads of war traffic on the move . . . at the same time, easily maintain your road beds. No need to run the danger of accidents, either! Off-track equipment handles your entire grading and maintenance operations and eliminates interference with trains. More and more railroads are adopting this safer, faster, more economical method. You will find it pays, too!

Allis-Chalmers offers you a wide choice of equipment . . . units to fit your exact requirements — tractors with bull-dozers, scrapers, shovels . . . motor or pull-type graders . . . sheep-foot rollers and similar machines. You can get new outfits if you qualify under government limitations — 15% of our crawler tractor production is released for essential civilian requirements. Good used units may well serve your purpose. Our dealers often have such equipment available . . . or may know where it can be obtained. If interested in used equipment write to us and we will be glad to place you in touch with an Allis-Chalmers dealer. You will always find our dealers glad to cooperate in every possible way.

ARMY E NAVY

ALLIS-CHALMERS

TRACTOR DIVISION · MILWAUKEE · U. S. A.

Mall Portable Power Tools

TRADE MARK

★ Speed Up Right-Of-Way Maintenance and Construction

★ Mall CHAIN SAW

5 H.P.

GASOLINE ENGINE MODEL

36" Capacity. Also available in 24" and 48" sizes. Pneumatic Models if desired.

Cuts heavy timber and piling in a fraction of the time required by hand. Automatic clutch prevents stalling the engine when saw is forced or pinched too hard. Swivel feature permits cuts at necessary angles. Easily and quickly sharpened on the job.

★ Mall Saw

MODEL 120

12" Blade
4 5/8" Cutting Capacity
Also Pneumatic Models

A big time and labor saving tool for extensive sawing and ripping heavy lumber and timbers for concrete forms, trestles, bridges, buildings, crossings, platforms and other uses. Also operates an abrasive wheel for sawing non-ferrous metal up to ½" in thickness, cutting and scoring tile, stone and concrete.

★ Mall 5 H.P. Off-the-Track PORTABLE POWER UNIT

The MALL easily portable, 5 H.P., off-the-track unit is always ready for work. No time lost looking for power lines—repairing air lines or hose connections. It operates all day on very little gasoline—runs by itself and furnishes plenty of power to drive quickly interchangeable attachments for Rail Switchpoint, frog and crossing Grinding, Sanding, Wire Brushing, and Drilling in Wood, Brick, Concrete or Steel.

★ Mall CONCRETE VIBRATORS

It is easy to save manpower, time and materials with this easily portable MALL 1½ H.P. Gasoline Powered Vibrator. It will place low-water-cement-ratio concrete faster and better than can be accomplished by any other method and assure a stronger, watertight job free from honeycombs and voids. Variable speed gasoline engine also operates 8 other interchangeable tools for Wet Wall Rubbing, Sanding, Grinding, Wire Brushing, Drilling, Sawing, Pumping and Sharpening Tools. Other gasoline engine, electric and pneumatic models also available.

1½ H. P.

Write for Literature and Prices to Railroad Department

ARMY E NAVY

MALL TOOL COMPANY

7746 S. Chicago Ave.,
Chicago 19, Illinois

with

RACINE

HIGH SPEED PORTABLE RAIL CUTTING SAWS

Do These Jobs easily, quickly and safely

1. Properly cut and fit rails at interlocking plants, crossings and switches.
2. Effectively close track in rail laying operations.
3. Accurately cut rails for insulated joints.
4. Proper staggering of joints in curves.
5. Removing split or worn and battered rail ends.
6. Cutting out portions of wheel — burned rails and fissures.

Save Manpower, Tool Costs and Time

The experience of one large railroad shows better joints with a 10% lower maintenance cost. 85-lb. rails were cut in 3 to 5 minutes. The cost average was only $2.20 per rail, including all operations necessary to replace rail. Request complete information and prices. Address Dept. RE-S.

Investigate Racine's Line of Metal Cutting Machines, Oil Hydraulic Pumps and Valves

These Production Saws of Modern Industry for fast and accurate cutting of all metals are available in capacities 6″ x 6″ to 20″ x 20″.

Racine Oil Hydraulic Pumps for holding, clamping, forming, bending, and feeding operations. Racine Oil Hydraulic Valves in 3/8″ to 1½″ standard pipe sizes.

STANDARD FOR QUALITY AND PRECISION
RACINE
RACINE TOOL and MACHINE CO.

This Pipe Will Go Back To Work with Long Life Assured

12 in. pipe before cleaning for Mid-Western Railroad, Creston, Iowa

TYPES AND SIZES OF PIPE CLEANED

WATER MAINS: 4" to 30" O.D. —laterals and branch lines for buildings ½" to 6" I.D.—all sizes of pipes for sprinkler systems.

DRAINAGE SYSTEMS: Round house sewers 40" to 48"—Sanitary systems for buildings 1¼" to 12".

CLEANING EQUIPMENT:

1. Electrically operated pipe cleaning machines.
2. Hydraulic cleaning tools.
3. Mechanical dragging equipment.

JOB ANALYSIS
of a recent Cleaning Contract at Youngstown, Ohio

Size of main	8" Cast iron
Length of cleaning	10,600 ft.
Type of cleaning	Hydraulic
45 degree ells	7
Cleaning time	75 minutes
Quantity water before cleaning	390 gals./min. at 90# pressure
Quantity water required	450 gals./min. at 40#
Quantity water after cleaning at 40#	750 gals./min. (estimated)
Quantity water after cleaning at 50#	580 gals./min.
Present pumping time at 40# pressure	7 hrs. less than before cleaning
Power savings	16%
Deposit removed (estimated)	60 tons

PIPE CLEANING SERVICE TO THE RAILROADS

Complete engineering and contract service — Leading railroads utilize this service in maintenance operations.

Experience

Over one thousand industrial jobs guarantee an economical solution of pipe cleaning problems.

Supervision

Trained service superintendents are located at branches in Pittsburgh, Chicago, Baltimore and Philadelphia.

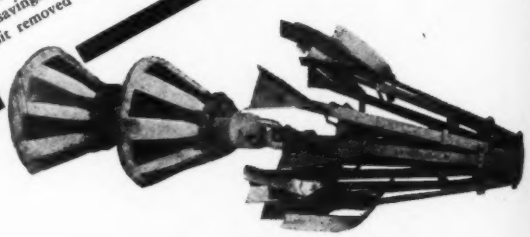


Illustration of 16" Hydraulic Cleaning Tool

NATIONAL METAL CONGRESS—Oct. 18-22, 1943
The Palmer House Chicago

Room 904—L. R. Robinson—E. O. Berger—E. C. McFadden

PITTSBURGH PIPE CLEANER COMPANY
433 Melwood Street **Pittsburgh, Penna.**

Save Steel Today for VICTORY Tomorrow

Rail welding crew building up worn rail ends

Frog welding outfit building up worn manganese frog

Cutting down steel tank for re-erection by arc welding at new location

Reinforcing steel bridge by arc welding

TELEWELD

Maintenance Service

Includes Steel Conservation by Experts; Rebuilding battered rail ends, worn frogs and switch points; Cutting down and re-erecting steel tanks; Reinforcing steel bridges.

To save almost irreplaceable steel and to keep wartime peak traffic moving smoothly, many major railroads today are taking advantage of the TELEWELD Maintenance Service to maintain way and structures at peak efficiency.

TELEWELD, INC., offers to the maintenance official an unusually comprehensive service comprising a highly trained, efficient personnel of trained men, specially developed machines and processes designed to handle track and structural reclamation work, economically, thoroughly and speedily.

TELEWELD operations pictured here are a few of the many services which the Company features in its complete service program. They show money-, labor-, and time-saving procedures designed to eliminate batter and restore worn rail to original surface; restoration of worn crossings and frogs; the dismantling and re-erecting in new locations of water and fuel oil tanks of steel construction; reinforcing steel bridges to assure many more years of usefulness.

Write us today and we will gladly prove to you how you can utilize your present equipment and facilities to better advantage and save money as well as steel.

MEMBER

THE TRACK SUPPLY ASSOCIATION TSA

TELEWELD

INC.

Welding Engineers & Contractors

Railway Exchange Bldg.

Chicago, Illinois

To

ROADMASTERS and MAINTENANCE OF WAY ASSOCIATION OF AMERICA

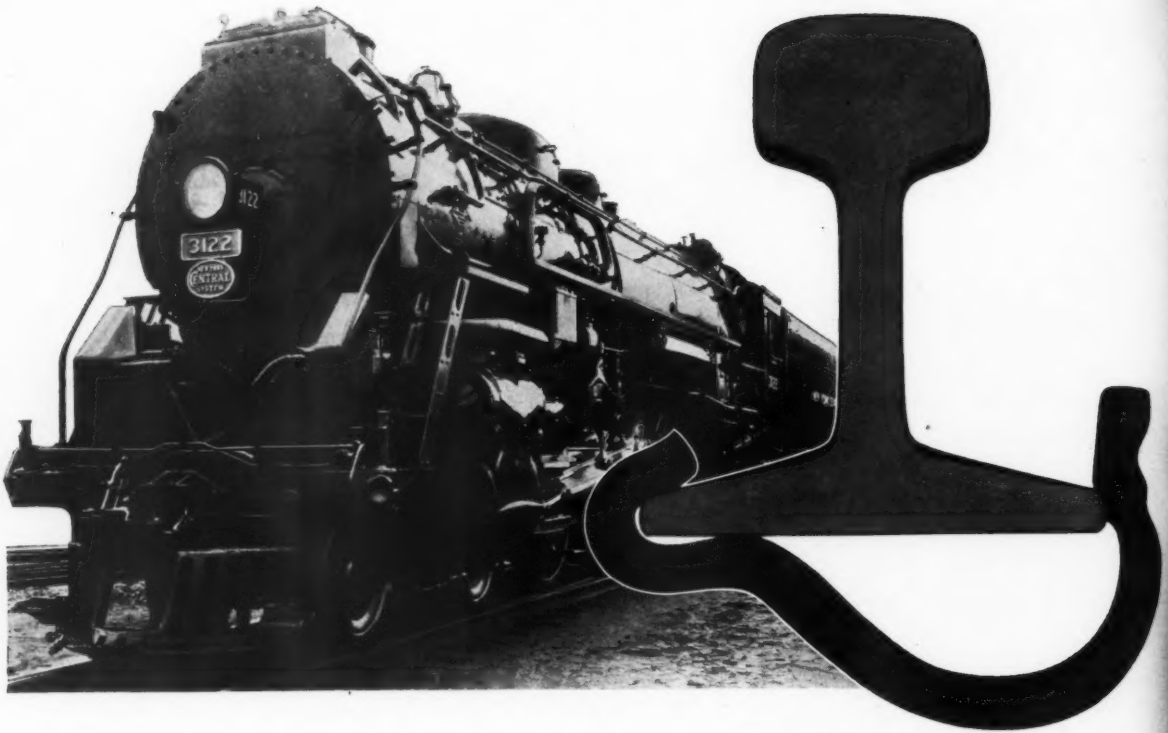
MEMBER
THE TRACK SUPPLY ASSOCIATION TSA

While we regret that this year you will not have your regular annual Convention, we take this opportunity to extend to your Association and to our many other friends in railway service the same hearty greetings that we would normally extend to them in person.

All of us realize that the railways are carrying the heaviest traffic load in history, as their part in the war effort, and our organizations will, at all times, be happy to render whatever assistance we can to assure successful maintenance of uninterrupted transportation.

WOODINGS-VERONA TOOL WORKS
WOODINGS FORGE and TOOL COMPANY

VERONA, PA.



The UNIT RAIL ANCHOR

Improved Heat Treatment makes Quality better than ever

1. Anchor is quickly forced into position by pressing down on tool handle

2. Anchor in top notch position grips new rail tightly

The Unit Rail Anchor is a one-piece device, with two notches, the top notch for new, the lower for undersized rail. The holding power in either notch is more than sufficient to withstand the severest strain. It is easily applied, and can be reapplied any number of times. The anchor is made of high carbon, high manganese steel, specially heat treated in Homo-Electric furnaces automatically controlled. This gives the anchor a tougher and more ductile structure resulting in longer service. It is round edged to reduce penetration in the ties.

3. In lower notch position grips undersized rail tightly

4. To remove Anchor, tool is applied to upstanding end of Anchor and pressed downward

New York Office
3712 Woolworth Bldg.
233 Broadway
New York (7), N. Y.

UNIT RAIL ANCHOR COMPANY, INC.
Subsidiary of Hubbard & Co. — Tool Division
Manufacturers of Quality Railroad Track Tools and Alloy Spring Washers per AREA Specifications
6301 Butler Street
Pittsburgh (1), Pennsylvania

Chicago Office
Room 924
322 S. Michigan Ave.
Chicago (4), Ill.

THIS LATEST TYPE TENDER

Was Developed to

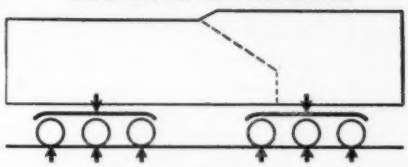
REDUCE WHEEL LOADS AND TRACK STRESSES

AMONG the important advantages of this newest type tender over the conventional tender design is the fact that ***lighter loads per wheel are obtained*** with more uniform distribution of weight at rail—***wheel loads and track stresses are reduced.***

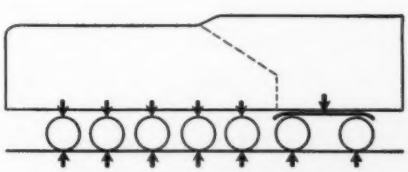
This design permits greater water and fuel capacity within restricted limits—***weight of tender is reduced*** and increased mileage is obtained between wheel turnings. Operating and maintenance costs are reduced and locomotive availability increased.

For high capacity tenders *specify* **COMMONWEALTH TENDER BEDS.**

LOADING DIAGRAMS



Tender with two 6-Wheel Trucks



Latest Type Tender Using Commonwealth Tender Bed

In service on these railroads—

UNION PACIFIC	*NORTHERN PACIFIC*
BOSTON & MAINE	*D. & R. G. W.*
D. M. & I. R.	*NEW YORK CENTRAL*

GENERAL STEEL CASTINGS

EDDYSTONE, PA. GRANITE CITY, ILL. • MADISON, ILL.

GIVING THE DEVIL HIS DUE...

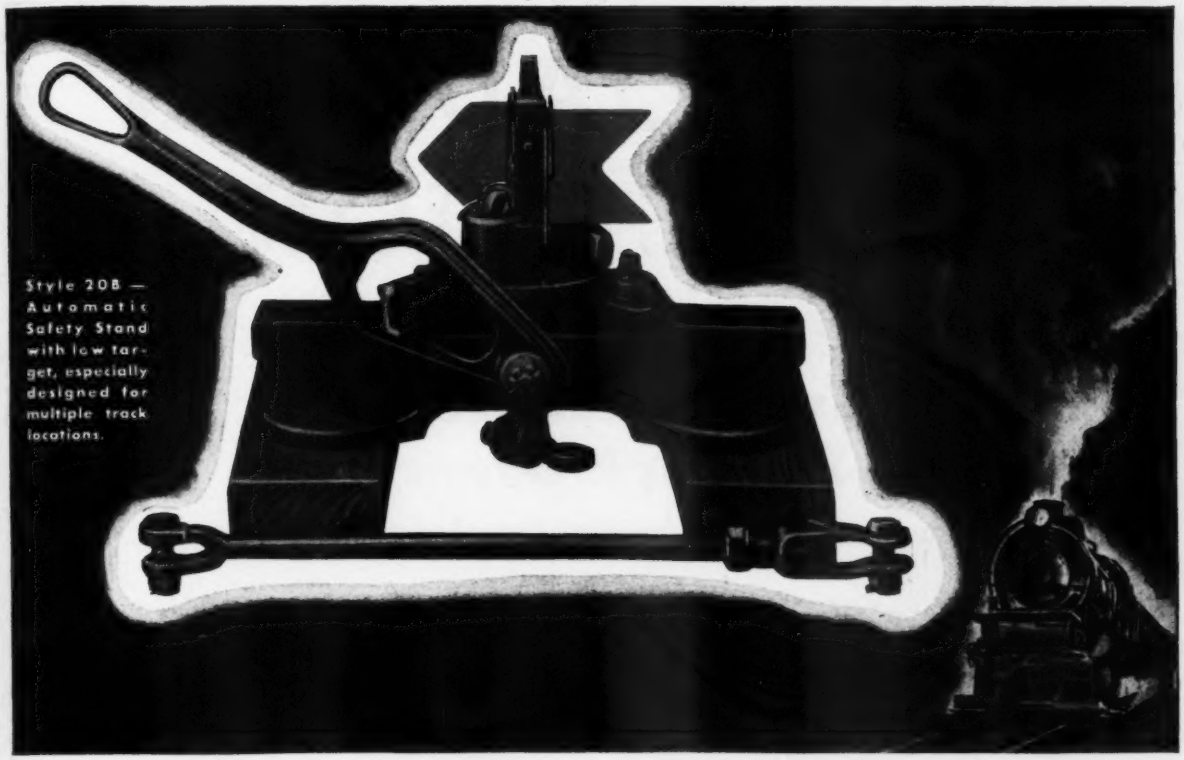
MADE BY THE MANUFACTURERS OF THE FAMOUS DEVIL LINE OF TRACK TOOLS

DEVIL Alloy Tool Steel Track Tools are proving their superiority in the severest test steel ever faced. Now, when tools and manpower are so difficult to obtain, the Devil Line is giving safer service over longer periods of harder usage with less timeout for re-dressing. The use of fine-grained electric furnace alloy tool steel, which is hand forged and specially heat treated, permits longer tool life and reduces accidents caused by spalling and chipping. . . . .

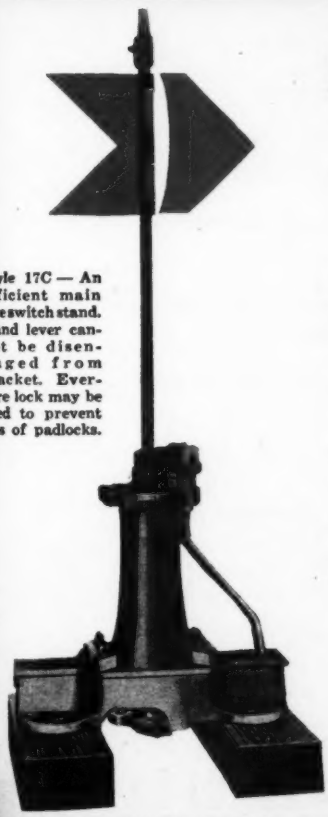
DEVIL Tools are still being produced to the same high standards of precision workmanship as before the war. However, unprecedented demands for these long-life tools are greater than available supplies although we have increased production over 100%. Therefore, we urge you to do your utmost to conserve the tools you have. In the meantime, Warren Tool Corporation is "working like the devil" to put the Devil Line where it belongs—in the hands of every track gang.

WARREN HEAVY HAND TOOLS

WARREN TOOL CORP. • WARREN, OHIO



Style 208 — Automatic Safety Stand with low target, especially designed for multiple track locations.



Style 17C — An efficient main line switch stand. Hand lever cannot be disengaged from bracket. Eversure lock may be used to prevent loss of padlocks.

SHOULD A TRAIN TRAIL THROUGH THIS SWITCH ...WITH THE STAND IN THE WRONG POSITION...

. . . no damage to either the switch points or the Racor Automatic Safety Switch Stand will occur! At hand-thrown switch locations the inherent automatic feature of this switch stand prevents such damage and reduces the possibility of break-down, unnecessary delay and time-consuming repairs to track and equipment.

The position of the switch points is indicated by target or lamp. All models are designed to eliminate fatigue failures and to withstand operating stresses.

Other operating and construction features will gladly be explained by our representative.

AMERICAN **Brake Shoe**

Eversure Lock — furnished when specified.

RAMAPO AJAX DIVISION RACOR 230 PARK AVE., NEW YORK

MILLBURN, N. Y. • NIAGARA FALLS, N. Y. • CHICAGO, ILL. • EAST ST. LOUIS, ILL. • PUEBLO, COLO. • SUPERIOR, WIS. • LOS ANGELES, CAL. • SEATTLE, WASH. NIAGARA FALLS, ONTARIO


Part of the Crew
that 'gets 'em through'
is not aboard
They're aboard motor cars inspecting the roadbeds, and keeping the right-of-way in shape to "get 'em through."
BUDA motor cars are easy to handle . . . safe . . . reliable!
They give the kind of performance necessary to keep them rolling.
Illustration shows the powerful, safe, roomy, light weight BUDA Roadmaster, 2 to 4 man Inspection Car. Write for descriptive bulletin.
BUDA
HARVEY (Chicago Suburb), ILLINOIS

No. 178 of a Series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO 3, ILL.

Subject: Post-War Possibilities

October 1, 1943

Dear Reader:

You may recall that last month I referred to the rapidly increasing interest in post-war planning that is developing in so many quarters and mentioned a number of questions as indicative of the problems that will confront those who are concerned with the upkeep of tracks and structures when hostilities cease. A few days ago I received a letter from the chief engineering officer of one of our largest railways, bearing on this subject. Believing that it will be of interest to you, I am quoting this letter as follows:

"Recently while discussing some of our building problems, a question arose whether the present extensive building program brought about by the War Effort had developed any new materials or construction methods that would result in savings in either the cost of material or of labor.

"The thought was that in some cases possibly buildings did not need to be too permanent; for instance around terminals, repair tracks, etc., a life of 20 to 25 years might be enough to plan on, for within that time conditions probably will change so that an entirely different arrangement may be desirable. I am writing to inquire if any of your editors might have information bearing on this subject which might be helpful to us, or if they could put us in touch with anyone who might be of help to us."

This letter is indicative of the alertness of many maintenance officers to the multitude of developments of this war that, at its termination, will be available to them--in metallurgy, in plastics, in ingenuity of design. It illustrates the type of thinking that I am sure that you believe will streamline railway operations, in their many ramifications, after the war and enable the railways to so revise their procedure as to take fullest advantage of these new materials and new services in order that they may retain the largest possible share of the traffic that they are now handling so efficiently.

I am sure that you feel that the days that are immediately ahead hold much of promise for you and that you are eager to take full advantage of their discoveries. We of Railway Engineering and Maintenance are keying ourselves to the task of uncovering and bringing to your attention as many of these developments as possible from month to month.

Yours sincerely,

Elmer T. Howson

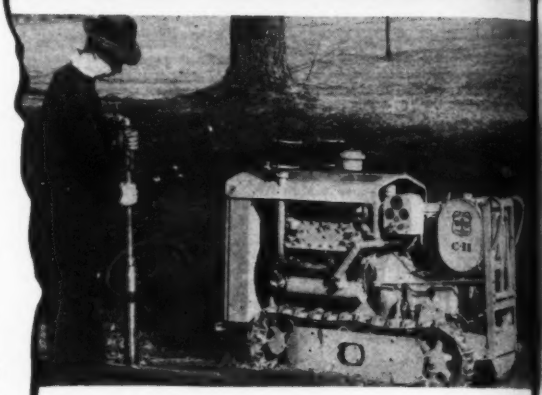
ETH:LV

Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

A CONSTRUCTION AND MAINTENANCE CREW

. . . on wheels or crawlers



Putting a **SCHRAMM** Self-Propelled Crawler or Rail Car COMPRESSOR in the hands of even unskilled laborers is like providing infantry men with jeeps—*they go places and get things done!* Whether it's an emergency call on the Right of Way, or a Spur on the branch line, air power at the touch of a button enables you to do the impossible in a hurry.

Gasoline or Diesel powered models mounted on rail cars for standard track gauge can be furnished either self-propelled from same engine that drives compressor, or non-self for towing. The lightest, most compact rail car ever built.

"Off-Track," Crawler type compressors are mechanically driven. Each track is independently driven by a forward and reverse clutch controlled by the operator. The units are extremely narrow, being designed to go between tracks, or on the shoulders of the "Right of Way."

From Alaska to the Equator, Construction Engineers have found **SCHRAMM** means hard-hitting dependable, economical power —regardless of temperature. For all Schramm Compressors have straight-lined cylinders, water jacketed for correct lubrication at all temperatures. . . . Mechanical intake valve. . . . Operate at most economical engine speed, using less fuel for air delivered. No auxiliaries to buy. . . . Shipped ready for action.

WRITE FOR CATALOG 42-P

SCHRAMM INC.

THE COMPRESSOR PEOPLE • WEST CHESTER, PENNSYLVANIA

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

OCTOBER, 1943

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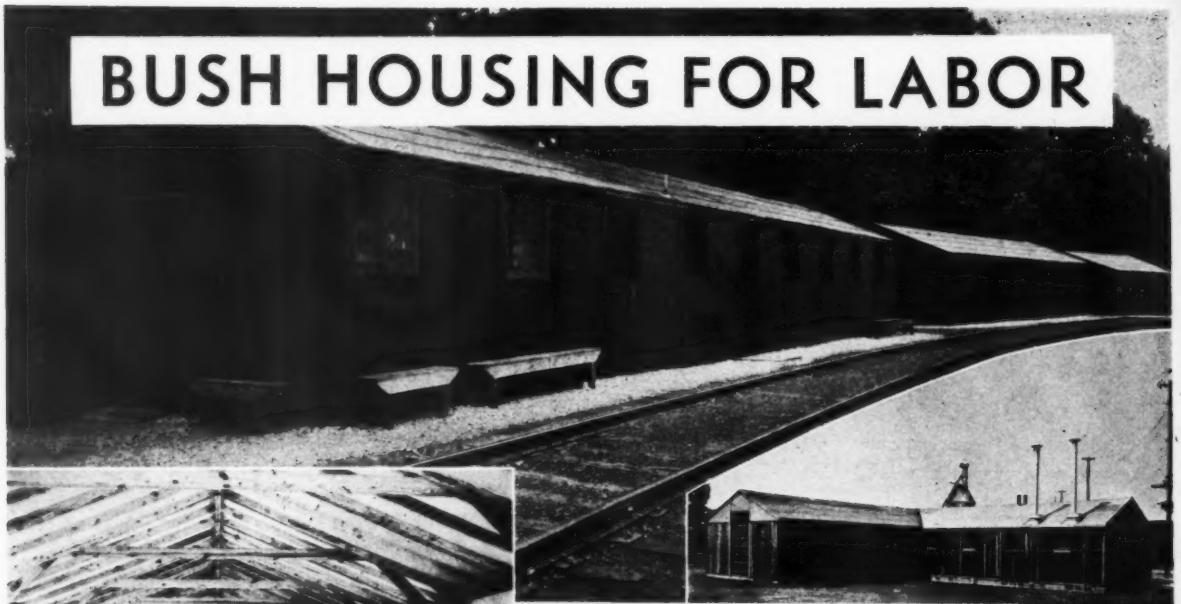
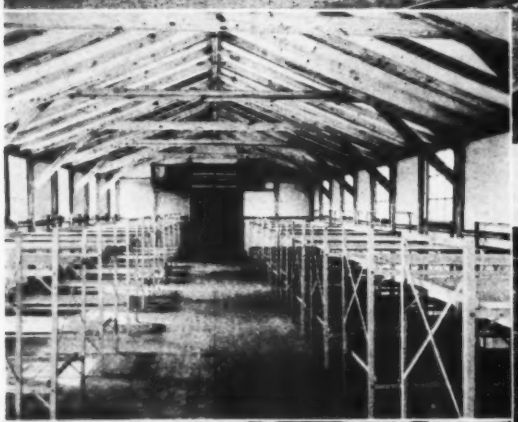




YOU NAME THE NEED—

WE WILL SUPPLY THE BUILDING

Here is a versatile building so simple to erect, it will meet every reasonable demand for railroad use.

- **Labor Camps for from 40 to 400 or more men—including bunk houses, kitchens, store rooms, mess halls, wash and toilet and recreational facilities.**
- **Machine, tools, equipment and supplies storage.**
- **Facilities for the new problem of providing for female labor—for changing, wash and toilet rooms, rest rooms, etc.**
- **Here is a building completely demountable. Can be taken down for re-erection wherever needed, or be stored until needed at some future time to eliminate taxation.**

THE BUSH TYPE "B" ALL PURPOSE BUILDING

- **It takes experience—specialized experience in prefabrication—to design and panelize a building so good. Bush has this experience—ten years of producing thousands of prefabricated structures for use all over the world.**
- **Tell us about your requirements. Let our engineers advise you how your needs can be best adapted to this versatile building—or any other type of prefabricated structure that you might require.**

BUSH PREFABRICATED STRUCTURES INC.

DIVISION OF CLINTON G. BUSH CO.

370 LEXINGTON AVE. NEW YORK 17, N. Y.

Railway Engineering and Maintenance

Cars—

Use Less of Them

The next sixty days will make railroad history. The railways are approaching the yearly period of maximum car loadings with a record for performance that has won universal acclaim. They are handling this unprecedented traffic with less equipment than in previous peak periods of lesser magnitude. The necessity for continuing to meet all demands during the month now opening constitutes a challenge to every railway employee; for those in maintenance of way service, with their relatively large needs for cars and locomotives for handling the materials used in their operations, the conditions demand maximum efficiency in the use of this equipment in order that it may be withheld from revenue service the shortest possible time and released at the earliest possible moment.

The Measure of the Task

In order to realize the magnitude of the task that is facing the railways, it is informative to note that in the first six months of this year, 20.6 per cent more ton miles of freight traffic were produced than in the corresponding period of the previous year, which latter period in turn recorded the largest volume ever handled up to that time. Contributing to this achievement, miles per freight car per day averaged 47.7, the highest ever recorded; the percentage of empty car mileage declined to 36.6, as compared with 37.3 in the last half of 1942, while the load averaged 40.61 tons per car, as compared with 37.56 tons last year, this latter increase alone saving the use of 114,632 cars and reducing car loadings by 652,944. To add to the problem, the average haul per ton of freight for the first quarter of 1943 was 515 miles, as contrasted with 454 miles in 1942. These indices of the service being rendered by the railways comprise a most noteworthy record.

Yet still tougher days are ahead. Since July 1, every week but one has shown an increase in car loadings over last year and recent weeks indicate that the demands in October will exceed the peak requirements of a year ago by a considerable amount. Indicative of the narrowing margin of safety is the decline in the average daily freight car surplus to only 24,417 cars in the week ending August 28, 1943—less than half the 58,561 car surplus a year previous and comparing with 130,796 surplus cars on the same date in 1939. As relatively little aid can be expected from additional new cars or locomotives (only 12,030 new freight cars were placed in service in the first seven months of 1943 as compared with 51,606 cars in the same period a year ago), service demands can be met only by the more intensive use of the equipment now available.

Where Maintenance Men Can Help

Since the purpose of a railroad is to produce transportation, it becomes the responsibility of every employee to contribute his utmost to this end. Maintenance of way employees can do this by loading and unloading promptly all cars consigned to them and by so arranging their work as to load these cars heavily and thus reduce the number required. It is imperative, also, that they give primary attention to the maintenance of those facilities that will insure continuity of traffic movement in order that there may be no interruption to the even flow of this traffic because of defects within their control. In these ways, maintenance employees can aid most effectively in meeting the challenge.

Track—

Getting New "Breaks" From Mechanical Forces

THAT the railway track structure of the future will be subject to less abuse by locomotives, in spite of the heavier loadings and higher speeds that will unquestionably prevail, now appears certain. In fact, this long cherished hope of the track forces is already becoming a reality as the mechanical and engineering officers of the railways, together with the builders of equipment, draw closer in co-operation in the solution of their conflicting interests of design for the good of railroading as a whole.

Since the beginning of the railroads, there has been a constant race between the locomotive and the track structure, particularly rail. As locomotives grew in size and weight to handle increasing traffic, the weight of rail was increased progressively from less than 56 lb. per yd. to 112 lb., 131 yb., 136 lb. and heavier, until it is today capable of carrying any well-designed equipment that has been built.

Engineering officers do not contend that the ultimate in rail design has yet been achieved; in fact, tests of recently developed designs indicate that they incorporate definite improvements over present standard sections. However, they have contended, and it has been amply demonstrated, that present designs and weights of rail will carry present locomotives at any speeds at which it may be desirable to run them, if these locomotives are properly counterbalanced and otherwise designed for these speeds to prevent destructive nosing and hammer-blow action. Beyond this, they hold that if the economics of the situation could be disregarded, rail of present standard design could be increased in section until it would withstand even the most destructive effects of poorly designed locomotives. Likewise they know that the damaging effects of many heavily loaded locomotive tenders of conventional design could be overlooked if economy were not a factor. But since economy is a factor, and a most important one at all times, these officers have long pointed an accusing finger at the mechanical department and have urged greater attention to locomotive counterbalance and to improved tender design as the only economical, if not practicable, solutions to the locomotive—rail problem.

Today, these pleas are being heard as never before. Stimulated by the demand for higher train speeds and the need for impressing many old locomotives back into important main-line service, railway mechanical officers and equipment builders have set about to overcome this problem, and have joined hands officially in committees with the engineering officers of the railways to help bring this about. Together, these interested parties have conducted repeated and costly road tests involving hundreds of runs of locomotives with various counterbalance settings, and thousands of strain gage measurements to record the varying stresses set up in the rail. The facts developed in these tests have already proved of great value, and are already reflected in the re-design of hundreds of the older locomotives on the railways, which otherwise could not be employed at present-day speeds without seriously destructive effects upon the tracks.

At the same time, locomotive tenders, the second most serious offender among rolling equipment in its effect on the track, have not been overlooked. With the demand for long engine runs with a minimum number of stops for fuel and water, calling for larger tenders and heavier tender loads, there has been a growing recognition that tender wheel loads must be kept within safe limits dictated by present, otherwise adequate, rail metallurgy and design.

Co-operating to this end, one builder of locomotive tenders has developed a type embodying a one-piece bed and wheel arrangement similar to a 4-10-0 locomotive, with 42-in. wheels spaced uniformly throughout its length. Through this design, the light weight of the tender is reduced 10,000 to 15,000 lb. below that of tenders of conventional design, the load per inch of wheel diameter is reduced, and, in spite of the larger wheels employed, it has a lower center of gravity than conventional tenders with 36-in. wheels. That the merits of this tender are not being overlooked by mechanical officers is seen in the fact that although it is a comparatively recent development, more than 170 of these units are already in service or will be put in service in the near future.

These are trends of vital interest to engineering and maintenance officers. In the light of them, these officers can face the future of higher train speeds and heavier loads with a greater degree of confidence in their track structure, and, at the same time, with the stimulating feeling that to a greater extent than ever before their associates in the mechanical field are pulling with them to help attain their major goal of maximum safety and economy in track construction and maintenance.

Maintenance Men—

At Home and at Our Fighting Fronts

NEVER before in the history of warfare has an army been so adequately backed up by skilled railway troops as are the armies of the United States that are now moving in on the "underbelly" of Europe and ready to move in elsewhere on the continent when the need arises. And it should be of interest, and a source of satisfaction to every track and bridge and building man on the American railways to know that they are well represented, and that the rail lines behind our advancing armies, wherever they may extend, will be in capable hands.

Many maintenance men know of the organization and functioning of the Military Railway Service, know of the definite assignments of engineering, track and bridge and building officers and men in this organization, and have heard of the heroic part which these men have already played in the North African campaign. Many have vivid memories of the call that was answered by thousands of their fellow workers, and of sons and other relatives who left to join army railway service. But many others, representing a large majority of maintenance men back on the home front, have never gained or have lost this picture.

Shrouded by secrecy and censorship, few know that it was a division engineer on a western road who was early sent to England to represent American rail transportation on that front, that other division engineers, roadmasters, supervisors and foremen have since followed to that and other fronts—indeed, have already acquitted themselves valorously under fire. Gradually, however, the stories are filtering back—from England, from Iran,

from North Africa and elsewhere—each a record of untiring effort and achievement, upholding the traditional energy and devotion to duty of maintenance men over the years. These stories have been and will continue to be a source of interest to every maintenance man back home. But they should be more than that. They should be an inspiration—a challenge—that while other railway maintenance men rehabilitate and uphold the railways on the fighting fronts, there shall be no failure on the equally vital railways of the home front.

Power Machines—

Getting More Work with Less Men

ONE of the most important problems confronting maintenance officers at present, and one that will likely continue as long as the war lasts, is how to get more work done with less men, many of whom are not very effective at best. The only feasible solution so far offered is to substitute machine-power for man-power. When this is done, however, the problem is only transformed and becomes that of getting maximum output from equipment.

Temporarily, at least, more work can be obtained from a machine if it is worked more hours per day, and most roads are now working their equipment up to ten hours. Not many of them have yet attempted to double-shift work equipment, however. In general, the reasons given range from the belief that it is less safe to work the machines outside of daylight hours, to lack of men to provide the gangs necessary to keep the machines in operation. Regardless of whether these reasons are valid, too often much less than the capacity of the machine is being realized because it is not worked full time.

To keep a power machine in operation so that its full potential output will be realized requires good management, close supervision and an accurate knowledge of the work upon which it is engaged. Particularly in view of the difficulty of obtaining repair parts, it also requires careful operation and a high order of maintenance. While the time that a machine is worked is an important element in the output that may be obtained from it, a poorly-maintained machine is seldom productive and may not only reduce its own output, but that of a large gang as well, and, in addition safety of operation may be impaired.

An inexcusable loss of productive time may occur when a machine is shipped from one division or one job to another. Sometimes the recipient has not been told when to expect the machine and is not ready for it when it arrives; sometimes he is expecting it but is not notified of the shipment, so that the unit may be delayed enroute without either the shipper or the consignee being aware of it. Again, repairs may be required before the machine can be put in service, this having been a common complaint in the past. There are also many other situations in which power machines are allowed to remain idle.

The aid that can be obtained from power machines is too valuable today to allow it to be frittered away by poor management, lax supervision, indifferent operation or poor maintenance. Every maintenance officer who is interested in the use of work equipment should make it his business to know what each unit is capable of doing and, if it is not producing at this capacity he should know why. If it is idle, he should be aware of the fact currently, not after days of productive time have been lost.

The season is approaching when many units of equipment will be taken into the shop for overhauling. If repair parts are needed, this fact should be known well in advance of the shopping, for many of these parts cannot be obtained easily. The need for critical materials by our armed forces is still so great that every effort should be made, such as applying the relatively new art of metallizing, to recondition the machines without ordering new parts, where this is practical. In any event, every machine should be put in the best possible condition, for it will be called upon to perform more service next year than ever before.

Water Columns—

Too Important to Permit Failure

FROM the moment of Pearl Harbor, the necessity for quick and dependable movement of men, munitions and military supplies, as well as raw materials to war industries, has given a new importance to railway operation, which has increased steadily as new fighting fronts have been opened and others extended. Maintenance officers so far have done a remarkable job despite greater shortages of both labor and materials than most of them have ever experienced before. While they may be expected to continue this record in spite of all difficulties, winter, in the northern sections of the country, may impose additional burdens with which it becomes difficult to cope.

While not in universal use, water columns are employed so extensively that at many places there are no other means for watering locomotives. In such cases, an inoperative water column may represent one of these burdens, and may result in serious delays to trains. This points to the importance of good maintenance. Water columns formerly gave a great deal of trouble from freezing during prolonged cold weather. While some of the earlier designs were partly or wholly responsible for this trouble, a frozen water column can now be traced almost invariably to a poorly-constructed or a poorly-maintained valve pit, or both.

For this reason there can be no excuse for allowing a water column to freeze. Every water-service man is, or should be, familiar with the type of pit that will eliminate frozen water columns. It happens occasionally, even where the needed protection has been provided, that some one fails in his duty and a water column freezes. If the trouble occurs frequently, however, it is ample evidence of incompetence, or equally bad, of a lack of appreciation of the responsibility that rests upon every maintenance employee to see that structures and facilities are maintained to the requisite standard and that no obstacles are allowed to interfere even slightly with the free movement of traffic that may mean life or death to our fighting men.

Frozen water columns do not occur frequently today, but because the remedy is so simple and so easily applied there is no excuse for them to occur at all. Pits of concrete or treated wood, fully insulated against low temperature, adequately drained and, if necessary, heated with an electric light bulb, will insure immunity against failure from low temperature.

Pennsylvania Disastrous

On Sunday, September 12, a block-square area of the elevated trainshed of this company's Broadstreet station at Philadelphia was completely gutted by fire. However, so effectively was the reconstruction work organized and prosecuted that the last track was restored to service seven days later. This article describes and illustrates how the feat of restoration was accomplished

The Fire at Its Height as Seen From a Point West of the Station

THE maintenance of way and structures department of the Pennsylvana was confronted with a major problem in reconstruction during September as the result of a fire that engulfed a block-square area of the 16-track elevated trainshed area of its Broad Street station at Philadelphia. Striking on Sunday, September 12, the conflagration all but destroyed the tracks, platforms and canopies in the affected area, and seriously damaged their steel-and-wood supporting structure, causing extensive and costly loss of property.

Quick Work

Keyed to a wartime pitch of speed and efficiency, the railroad's acceptance of the challenge presented by the fire was instantaneous, with the result that even before the fire was officially declared extinguished, the machinery of rehabilitation had been established and was functioning smoothly. The fire burned for nine hours, but within 20 min. after it was discovered a call for assistance in the work of reconstruction had gone out to other divisions of the Eastern region and the New York zone. Before two hours had passed, a supervisory organization had been set up and perfected to handle the repairs, and almost immediately a steadily expanding volume of men, materials and equipment began streaming toward the site of the fire.

Less than twenty-two hours after the fire was reported, a regularly scheduled train, using temporary facilities, pulled out of the station for New York. Within three days, two of the station tracks went back into service on their former locations, these being followed by additional restorations at the rate of about two tracks per day until the track-work had been completed. As the work progressed, additional train service was restored to the station, and by 8 p.m. Sunday, September 19, just a week after the fire occurred, all regularly-scheduled trains were operating into and out of the Broad Street station on a normal basis.

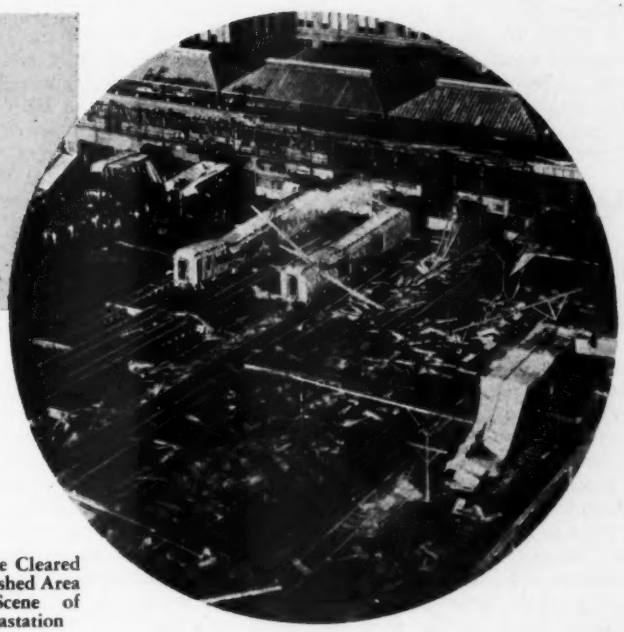
Station Details

Completed in 1881, the Broad Street station is situated at the extremity of an elevated stub-end track layout that extends westward from the station to connect with other tracks of the company in the westerly part of the city. Immediately west of the station, the elevated structure contains 16 tracks and is a city block in width, being flanked by Market street on the south and Pennsylvania boulevard on the north. In the vicinity of the station there are two underpasses through the elevated structure, one of which, carrying Fifteenth street, passes directly along the west side of the station (i.e., immediately beneath the station end of the trainsheds), while the other, carrying Sixteenth street, is located a block to the west. Between these two underpasses, the elevated structure originally consisted of steel columns supporting transverse beams into which were framed longitudinal girders for carrying the tracks and platforms. The area is enclosed along both sides by brick walls, containing openings to give access to the interior which contained baggage and storage rooms and other facilities.

Originally, the station track layout was surmounted by a balloon-type trainshed, but this was removed following a fire in 1923, being replaced with butterfly canopies of timber construction with corrugated iron roofs. The supports for the catenary wires (this is in electrified territory) consisted of 10-in. channels spanning between upward extensions of the timber columns carrying the canopies.

Following the fire in 1923, which resulted in extensive weakening of the steel structure, timber shoring was installed generally under the trainshed area to help support the tracks and platforms.

Meets Test of Trainshed Fire



When the Smoke Cleared Away, the Trainshed Area Presented a Scene of Complete Devastation

For many years after its construction, the Broad Street structure was the Pennsylvania's principal passenger station in Philadelphia. In 1930, however, a large new station was completed at Thirtieth street which is slightly less than a mile west of the Broad Street station. At the same time the railroad built a new office building, known as the Broad Street Station building, which is located a block west of the Broad Street station on the north side of the elevated tracks. Beneath this building was established a suburban station with the tracks extending westward to a connection with the elevated tracks connecting the Broad Street station with the station at Thirtieth street.

The completion of these various new facilities had the effect of diverting certain traffic from the Broad Street station, but it still handles a large number of trains. These include trains departing for New York every hour on the hour during the day. Other traffic handled at the station includes trains to and from Washington, Pittsburgh, Cape Charles, Va., Atlantic City and other seashore points, and Trenton, N. J., via Bordentown. Altogether, there are 109 regularly scheduled trains that use the station daily, exclusive of 41 shuttle trains, utilizing multiple-unit equipment, to and from the Thirtieth Street station.

The fire broke out at 9:35 on the morning of September 12, in the vicinity of an engine room under the tracks near the intersection of Fifteenth street and Pennsylvania boulevard. Fanned by a brisk wind from the northwest, the fire spread rapidly throughout the station area, and, despite strenuous efforts by a large concentration of fire-fighting equipment, it was not brought under control until it had thoroughly gutted the entire trainshed area between the Sixteenth and Fifteenth Street underpasses.

Although the station building was filled with smoke during the fire, it was not damaged except for a strip of the concourse that projects beyond the west line of Fifteenth street. In this area, the floor was weakened and partially destroyed, and considerable damage was sustained by the outside wall and a line of skylights that

More Than 2,400 Men and 150 Power Tools and Machines Were Employed During the Peak of the Reconstruction Work.

extend the length of the concourse. A block to the west the fire was stopped short along the east line of the Sixteenth Street underpass, with the result that those parts of the platforms and canopies that project beyond remained generally intact.

Extent of Damage

Elsewhere, in the block-square area, however, the trainshed area was a charred and twisted mass of wreckage. All the canopies and the catenary wires were down, the platforms were totally destroyed, all ties were badly charred and the rails severely warped, and the timber shoring underneath the tracks was seriously damaged. Although none of the steel beams and girders collapsed, many of them were badly distorted and warped by the heat. Perhaps because it could not be easily reached by hose streams being played from the flanking streets, a strip of the structure comprising the middle third of the area sustained the greatest damage.

When the fire started, the 10 a.m. train for New York was in position for loading passengers on Track 14 (tracks are numbered consecutively from south to north). When it was attempted to move this train out of danger, it was found that, because the brakes of the last five cars had become locked, these cars could not be moved until later, with the result that they were damaged. Two other cars, one on Track 9 and the other on Track 7, were likewise damaged.

The railroad's immediate concern was to insure the continuity of its train service. This was done by diverting all trains to the various other stations in and about Philadelphia, namely the Suburban, Thirtieth Street and Camden (N. J.) stations. No trains were annulled. Even that part of the 10 o'clock train that escaped the fire, after being taken to the Thirtieth Street station and remade, departed for New York less than an hour behind schedule.

Rapid Decisions Made

Within a few minutes after the fire was discovered, it was apparent that there was little prospect of preventing it from engulfing the entire trainshed area between Fifteenth and Sixteenth streets. Hence, almost from the start of the fire the railroad was guided by the assumption that the block-square area of tracks and all their appurtenances would have to be rebuilt practically in their entirety. Moreover, it was immediately apparent that the only practicable procedure was to reconstruct the trainshed area in its original form, which meant that, in addition to the rebuilding of the tracks, platforms and canopies and other appurtenances, it would be necessary to install timber shoring under the steel work throughout the area.

Thus, even while the fire was still gaining, the magnitude of the task facing the road's maintenance department had been visualized and a course of procedure outlined. Also, it was apparent that, if the repair work was to be done in a minimum of time, it would be necessary to concentrate on the job as many men—carpenters, other mechanics, track men, and laborers—as could work efficiently in the limited area involved. It was obvious, therefore, that the manpower requirements would be far beyond local resources, and for this reason a call was sent out at 9:55 (20 minutes after the fire was discovered) to the other divisions of the Eastern region and the New York zone to send all the men that could be spared. A short time later, similar requests were made on several local contractors.

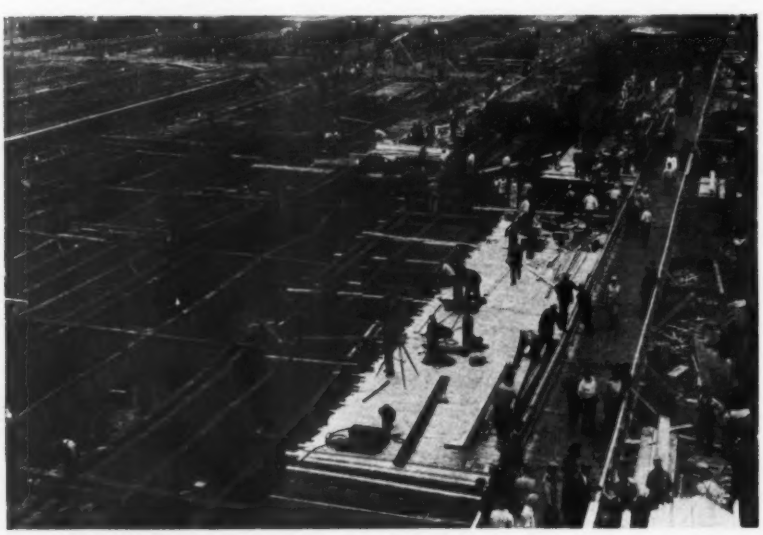
Materials—Equipment

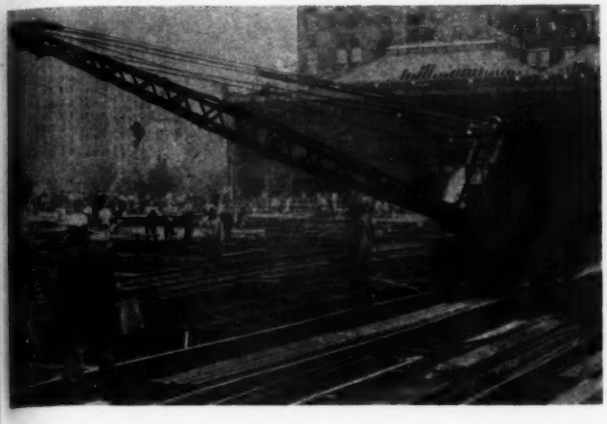
Meanwhile, the requirements for material were being appraised, and at 11:48 (about two hours following discovery of the fire) 20 carloads of material was ordered from the road's timber yard at Newport, Del. Later additional requests were made on this yard as well as that at Lucknow, Pa., near Harrisburg. In addition, considerable quantities of material were obtained locally, which for the most part were delivered to the station site in trucks. Simultaneously with these activities, the initial moves had been made to assemble at the site the large amount of equipment of different types that would be needed in making the repairs.

While the machinery of rehabilitation was thus beginning to function, a supervisory organization to handle the repairs was being perfected, which was completed within two hours after the fire was discovered. This organization was complete as to office and field assignments, and also was divided between the day and night shifts, for it was decided to carry on the work in two 12-hr. tricks. One measure of the magnitude of the undertaking is provided by the fact that the field contingent of the supervisory organization included nine master carpenters.

It should be reiterated that all the foregoing activities—the requests for men and equipment, the orders for materials and the establishing of the supervisory organization—were proceeding during the height of the fire. At 2:05 p.m. on Sunday the blaze was brought under control, and at 6:40 p.m. it was officially declared

Tuesday, September 14—Looking West from the Station, Showing Reconstruction Work Well Under Way





Five Burro Cranes Were Assembled and Used on the Track Level for Laying Rail and Handling Other Material

extinguished. So rapidly were events moving, however, that at 10:25 a.m. the work of removing debris from the area preparatory to undertaking the repairs was started, while at 1:30 p.m. the first consignment of material arrived for use in reconstruction.

Resumption of Train Service

While preparations were going forward to repair the damage, plans were being made to return the station to service while the work of rehabilitation was in progress. The scheme that was adopted for doing this contemplated using the undamaged portion of the station layout west of Sixteenth street for making up and loading trains. To give patrons access to these tracks from the station, a timber walkway was built across the burned-out area on top of what was left of Track 16, this work being done Sunday night and completed at 6:45 a.m. Monday morning. In the meantime, a stairway leading up to the track level was built at the corner of Sixteenth and Pennsylvania boulevard, but this was used largely by employees.

By 4:47 a.m. Monday power had been restored to the catenary wires of all tracks west of Sixteenth street, and at 7 a.m. a regularly-scheduled train left the station for New York. From this time forward during the week additional train service was restored to the station as rapidly as conditions permitted. To facilitate the handling of passengers under the temporary arrangement, as well as for the convenience of workmen, a timber walkway was built across the tracks at Sixteenth street, and later a second walkway was built across the damaged area on the location of Track 1.

A Large Undertaking

Some conception of the magnitude of the task of reconstruction is gained when it is realized that there were about 4,550 lin. ft. of elevated trackage to be built, with its catenary system and other appurtenances, including 2,400 lin. ft. of platforms and canopies. Also, the section of damaged floor in the concourse had to be rebuilt and necessary repairs made to the end wall of the station and the skylights over the concourse. One of the largest items of work involved was the removal of all the old rails, charred timbers and other debris from the area to make way for new work.

By Monday morning the repair work was in full swing and up to Monday night a total of 205 carloads of materials and equipment had been assembled which was later increased to 299 carloads. Two receiving yards were established for handling materials coming in by railroad, one at Thirty-eighth street and Mantua avenue, and the other at the company's South Street yard. Material assembled at the former location was sent to the station site in railroad cars, while that received at the South Street yard was hauled to the station in street trucks. Adjacent to the station area on its north side is a small municipal park, and this was used to good advantage as a yard for assembling and framing timbers which were used in the repair work.

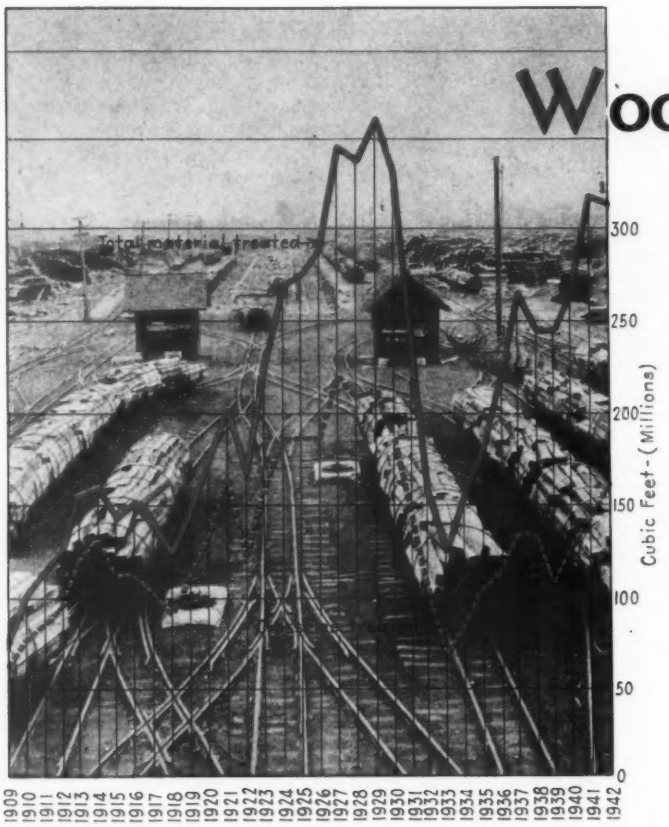
Work Highly Mechanized

To facilitate and expedite the work of rehabilitation, a large amount of mechanized equipment of various types was called into action. In view of the extensive nature of the timber work involved, it is not surprising that wood-working tools were present in considerable numbers. Equipment owned by the railroad included 29 power saws of different types, 12 wood-boring machines, and 4 tie-boring units, while contractors furnished a power saw and 4 wood-boring machines.

Cranes of various types comprised another class of equipment that was used extensively. Both crawler and truck-mounted cranes were used, for handling material from the street to the track level, this equipment also being found useful in removing and loading charred and burned material from the station area. Extensive use was made of cranes of the Burro type for handling materials on the track level. Cranes furnished by the railroad included 5 Burro cranes and 2

(Continued on page 782)

Thursday, September 16—Within Four Days After the Fire, Four of the Station Tracks Were Back in Service in Their Former Locations



Graphs Show Volume of Ties and All Wood Treated in U.S. Since 1908

Wood Preservation In All But

INDUSTRIAL activity, the need for enlarged port shipping facilities and continued construction requirements by both the navy and the army combined to continue the upward trend of wood preservation in all but two of the classifications of material treated in 1942, namely, poles and cross arms. New records were achieved in the volume of piles, wood blocks and miscellaneous materials, while ties and switch ties showed large gains; yet the decrease in poles and cross arms, resulting primarily from restrictions on civilian use of wire, were sufficient to create a slight decrease in the total volume of wood treated during the year. A total of 312,934,621 cu. ft. of wood was given treatment in 1942, a decrease of 6,229,801 cu. ft., or 2 per cent, from the 319,164,422 cu. ft. given preservative treatment in 1941, according to figures compiled by R. K. Helphenstine Jr., Forest Service, United States Department of Agriculture, in co-operation with the American Wood-Preservers' Association.

The volume of wood treated in 1942 was 49,074,426 cu. ft., or 13.6 per cent, less than the quantity treated in 1929, the peak year for the industry. It is also of interest that this volume has been exceeded in only 5 years of the 34 years that these statistics have been compiled.

For statistical purposes, the material treated year by year is divided into eight classes. In 1941, increases were recorded in ties, switch ties, piles, wood blocks, construction timbers and miscellaneous materials, while the quantities of piles, wood blocks and construction materials was greater than in any previous years.

As in all previous years since the beginning of the wood-preserving industry, the railways maintained their position as the principal consumer of treated timbers. Previous to 1939, this position had been assured by the fact that crossties constituted more than 50 per cent of the total volume of timber treated, and only the railways use ties. However, in 1939, 1940 and 1941, crossties fell below 50 per cent of the total volume of wood treated, indicating that other classifications were gaining faster than that of ties. Even during these three years, when switch ties, piles, poles, construction timbers and other items were added, the railways consumed more than two-thirds of the total volume of wood treated. However, in 1942, ties again represented more than 50 per cent of the total volume of wood treated, having risen to 51.9 per cent of the total and, together with switch ties, they represented 56.3 per cent of the total.

Crossties up 13.7 Per Cent

Despite an increase of 11.7 per cent in 1941 and of 19.3 per cent in 1940, crossties made a further gain of 13.7 per cent in 1942. In this year a total of 54,175,380 crossties were treated, a total volume of 162,526,140 cu. ft., or 19,534,083 cu. ft. more than was treated in 1941. Numerically, the increase was 6,511,361 ties. As in 1941, oak ties ranked first in number with 21,892,927, or 40.4 per cent

Crossties (Number) Treated by Kinds of Woods and Kinds of Preservatives—1942

Kind of wood	Creosote (1)	Creosote-Petroleum (2)	Zinc Chloride	Zinc-Meta Arsenite	Wolman Salts	Miscellaneous preservatives	Total	Per cent of total
Oak	17,444,181	4,433,445	350	.....	4,900	10,051	21,892,927	40.41
Southern pine	8,208,608	3,381,181	.....	.....	.....	1,352	11,591,141	21.40
Douglas fir	134,260	5,204,709	247,356	109,873	27,713	126,483	5,850,394	10.80
Gum	4,325,483	951,086	.....	.....	97,141	6,123	5,379,833	9.93
Tamarack	34,039	1,340,071	61,379	.....	.....	.....	1,435,489	2.65
Ponderosa pine	.....	1,416,257	.....	.....	.....	.....	1,416,257	2.61
Maple	418,013	989,498	1,000	.....	.....	.....	1,408,511	2.60
Lodgepole pine	.....	921,910	245,704	.....	.....	.....	1,167,614	2.15
Birch	426,318	536,078	2,000	.....	.....	.....	964,396	1.78
Beech	547,847	367,591	3,000	.....	.....	.....	918,438	1.70
Elm	564,094	115,924	1,000	.....	.....	.....	681,018	1.26
Hemlock	5,000	282,550	102,052	.....	.....	4,015	393,617	0.73
All other	694,486	359,558	21,701	.....	.....	.....	1,075,745	1.98
Total	32,802,329	20,299,858	685,542	109,873	129,754	148,024	54,175,380	100.00
Percent of total	60.55	37.47	1.27	.20	.24	.27		

(1) Includes distillate coal-tar creosote and solutions of creosote and coal-tar.
(2) Includes various percentage mixtures of creosote and petroleum.
(3) Includes chromated zinc chloride.

Holds Gains Two Classifications

Although record-breaking quantities of piles, wood blocks and miscellaneous materials were given preservative treatment in 1942, and although the preservation of ties increased 13.7 per cent, there was a decrease of two per cent, in the total volume of wood treated. Yet, despite this slight setback, the volume of wood treated in 1942 has been exceeded only five times in the history of the wood-preserving industry.

of the total, compared with 22,661,801 and 47.5 per cent in 1941. Southern pine remained in second place with 11,591,141 crossties treated, representing 21.4 per cent of the total, compared with 9,150,783, or 19.2 per cent of the total treated in 1941. Likewise, Douglas fir again ranked third with 5,850,394 crossties treated, or 10.8 per cent of the total, compared with 4,392,656 and 9 per cent in the previous year; and gum again stood in fourth place with 5,379,833 crossties, or 9.9 per cent, compared with 3,567,531 ties, and 7.5 per cent in 1941.

Other woods treated for crosstie purposes included tamarack, ponderosa pine, maple, lodgepole pine, birch, beech, elm and hemlock in the order given, aggregating 15.5 per cent of the total, while 1,075,745 crossties, or 2 per cent, were of woods other than those named.

Of the total number of crossties treated last year, 32,802,329, or 60.55 per cent, were treated with straight creosote or with solutions of creosote and coal tar; 20,299,858 ties, or 37.47 per cent, were impregnated with mixtures of creosote and petroleum; and 685,542 crossties, or 1.27 per cent of the total, were treated with zinc chloride or chromated zinc chloride. All other preservatives accounted for only 0.71 per cent of the total number of crossties given preservative treatment. All but 460 of the ties reported in 1942 were treated by pressure processes.

Of the total number of ties treated during the year, 34,408,117, or 63.5 per cent, were bored and adzed prior to treatment, compared with 27,450,340, or 57.6 per cent, in 1941, with 64.3 per cent in 1940, with 63 per cent in 1939 and with 70.5 per cent in 1938; 3,230,529, or 6 per cent, were bored but not adzed; 787,975, or 1.5 per cent, were adzed but not bored; and 15,748,759, or 29 per cent, were neither bored nor adzed. In 1941, 31 per cent, in both 1940 and 1939, 23 per cent and 1938 only 21 per cent of the crossties treated were not adzed or bored.

In 1942, a total of 167,377,616 ft. b.m. of switch ties were given preservative treatment, an increase of 25,099,680 ft. b.m., or 17.6 per cent, over the quantity reported in 1941. Oak maintained first place as a material for switch ties, with 92,541,615 ft. b.m., or 55.3 per cent of the total; southern pine remained in second place, having stepped up to this position in 1941, with 26,126,571 ft. b.m., or 15.6 per cent; Douglas fir, which dropped into third place in 1941, retained this rank with 20,960,822 ft. b.m., or 12.5 per cent of the total; and gum was again in fourth place with 10,302,373 ft. b.m., or 6.2 per cent of the total switch ties treated in 1942. Maple, beech, elm, birch, tamarack, hemlock, lodgepole pine and ponderosa pine, in the order named, and a few miscellaneous species made up the remaining 10.4 per cent.

Reflecting the urgent demand for increased harbor facilities to accomodate the shipping requirements created by our overseas operations, and despite continued increases of 70 per cent in 1939, of 7 per cent in 1940, and of 38 per cent in 1941, piles recorded a still further increase in 1942 or 32.2 per cent, to bring the total for the year to 42,179,210 lin. ft., the largest amount ever recorded, and breaking last year's record of 31,899,563 lin. ft., the largest amount ever recorded up to that time. As in past years, southern pine ran far ahead of other species, with 26,803,722 lin. ft., or 63.5 per cent of the total treated. Douglas fir was in second place with 14,691,901 lin. ft., or 34.8 per cent, slightly more than

Wood Preservation, 1909-1942
Together with Consumption of Creosote and Zinc Chloride

Year	Total material treated, cu. ft.	Number of crossties treated	Creosote used, gal.	Zinc chloride used, lb.*
1909	75,946,419	20,693,012	51,426,212	16,215,107
1910	100,074,144	26,155,677	63,266,271	16,802,532
1911	111,524,563	28,394,140	73,027,335	16,359,797
1912	125,931,056	32,394,336	83,666,490	20,751,711
1913	153,613,088	40,260,416	108,373,359	26,466,803
1914	159,582,639	43,846,987	88,764,050	27,212,259
1915	140,858,963	37,085,585	84,065,005	33,269,604
1916	150,522,982	37,469,368	96,079,844	26,746,577
1917	137,338,586	33,459,470	83,121,556	26,444,689
1918	122,612,890	30,609,209	56,834,248	31,101,111
1919	146,060,994	37,567,927	67,968,839	43,483,134
1920	173,309,505	44,987,532	70,606,419	49,717,929
1921	201,643,228	55,383,515	77,574,032	51,375,360
1922	166,620,347	41,316,474	87,736,071	29,868,639
1923	224,375,468	53,610,175	128,988,237	28,830,817
1924	268,583,235	62,632,710	158,519,810	33,208,675
1925	274,474,539	62,563,911	169,723,077	26,378,658
1926	289,322,079	62,654,538	188,274,743	24,777,020
1927	345,685,804	74,231,840	221,167,895	22,162,718
1928	335,920,379	70,114,405	222,825,927	23,524,340
1929	362,009,047	71,023,103	226,374,227	19,848,813
1930	332,318,577	63,267,107	213,904,421	13,921,894
1931	233,334,302	48,611,164	155,437,247	10,323,443
1932	157,418,589	35,045,483	105,671,264	7,669,126
1933	125,955,828	22,696,565	85,180,709	4,991,792
1934	155,105,723	28,459,587	119,049,604	3,222,721
1935	179,438,970	34,503,147	124,747,743	4,080,887
1936	222,463,994	37,952,129	154,712,999	4,127,886
1937	265,794,186	44,803,239	183,574,581	4,833,935
1938	244,221,442	44,598,678	166,183,891	4,829,590
1939	245,219,878	35,748,845	163,864,259	4,522,070
1940	265,473,149	42,666,598	174,625,305	5,180,896
1941	319,164,422	47,664,019	215,467,780	5,786,424
1942	312,934,621	54,175,380	216,347,768	5,051,263

*Includes chromated zinc chloride.

Treatment of Miscellaneous Materials—Ft. b. m.

	1942	1941	1940	1939
Lumber	287,191,977	281,006,886	234,133,962	186,429,495
Fence posts	37,401,538	28,061,805	17,926,013	13,819,213
Tie plugs	1,694,468	2,222,766	2,581,215	1,559,314
Crossing plank	None reported	1,360,584	724,506	None reported
Car lumber	272,103	220,668	None reported	48,204
Window sash*	None reported	5,920	416	.....

*Window sash were reported as a separate item for the first time in 1940.

double the amount treated in 1941; while Norway pine, in third place, with only 331,964 lin. ft., and oak with 322,653 lin. ft., together represented only 1.5 per cent of the total. The remainder, 28,970 lin. ft. consisted of ponderosa pine and a few miscellaneous species. All piles were treated by pressure processes and 98.3 per cent were impregnated with creosote or with creosote-petroleum mixtures, while the remainder were treated with Wolman salts, chromated zinc chloride and miscellaneous preservatives.

During 1942, for the first time, in addition to the normal preservative treatments which have been given wood for many years, a considerable quantity of wood was given fire-retardant treatments, largely as a result of accelerated demands incident to the war, to make fire-resistant construction possible without the use of critical materials. The total quantity of wood given fireproofing treatments in 1942 was 22,284,402 ft. b. m. In this treatment, 5,151,284 lb. of fire-retardant chemicals were used, consisting of 2,711,623 lb. of Protexol, 1,593,248 lb. of Minalith, 362,514 lb. of chromated zinc chloride and 483,899 lb. of borax-boric acid, the first two being proprietary compounds.

During 1942, the wood-preserving industry consumed 216,347,768 gal. of creosote, compared with 215,467,780 gal. used in 1941, an increase of 879,988 gal., or 0.4 per cent. It is of interest to note that the consumption of creosote in 1942 was greater than for any year since 1929 and that it was only 10,026,459 gal., or 4.4 per cent less than for that year, which was the peak year for the wood-preserving industry. Furthermore, the figure for 1942 has been exceeded in only three years previously. Mixtures of creosote and petroleum consumed 31,386,909 gal. of petroleum, compared with 32,388,706 gal. in 1941, a decrease of 1,001,797 gal.

In 1942, the wood preserving industry used 1,063,500 lb. of zinc chloride, or 340,363 lb. less than was consumed in 1941, while the consumption of chromated zinc chloride declined from 4,382,561 lb., in 1941 to 3,987,763 lb. in 1942, a decrease of 394,798 lb.

A total of 1,307,830 lb. of Wolman salts was used in 1942, a decrease of 348,184 lb. compared with the 1,656,014 lb. used in 1941. Likewise, the use of zinc meta arsenite declined from 268,795 lb. in 1941, to 239,786 in 1942, a decrease of 29,009 lb. In common with all other preservative salts, the use of Celcure decreased 61,208 lb., from 310,921 lb. in 1941 to 249,713 lb. in 1942. For the remainder of the preservatives, 5,593,084 lb. were miscellaneous salts, an increase of 4,600,580 lb. compared with the 992,504 lb. consumed in 1941. Of the total miscellaneous salts consumed during the year, 4,788,770 lb. were used in fire-retardant treatments, indicating a decrease of 188,190 lb. used for preservative treatments. Miscellaneous liquid preservatives were used to the extent of 194,589 gal. in 1942, compared with 136,074 gal. in 1941, an increase of 58,515 gal., or 43 per cent.

Treating Plants

The number of treating plants in 1942 was 236, or 1 more than in 1941. Of these, 231 were in active operation, 1 more than in 1941, and the largest number ever recorded. This was 8 more than in 1940 and 10 more than in 1938 and 1939, the previous record years. Five new plants, all of the pressure type, were constructed during the year, 1 was abandoned, 3 were idle, all of these being of the non-pressure (open tank) type, and 1 new plant remained inactive during the year. Of the total number of plants in existence during the year, 190 were commercial plants that treat wood by contract or for sale; 22 were owned and operated by railways; and 24 were owned by public utilities, mining companies, etc., to supply their own requirements.

Passenger Train Kills Nine Men in Section Gang

ON August 2, a westbound passenger (express) train on the Cleveland, Cincinnati, Chicago & St. Louis, struck a section gang engaged in surfacing track, near Ohlman, Ill., and killed nine men. According to the report of the Interstate Commerce Commission, from which the following is abstracted, the accident occurred in clear weather, at 9:05 a.m., on the westbound track of a double-track line, which was tangent for five miles east of the point of accident, and on level grade. Eight members of a section gang of 14 men were in the track operating pneumatic tie tampers, the compressor for their operation being set off at a point 85 ft. east of where they were working.

Second, 431, a westbound, first-class express train, carrying 11 express cars and 1 coach approached the point of accident at a speed of 65 miles an hour. There were no train orders restricting the speed, 80 miles an hour being the authorized speed; no warning signals had been placed and the gang was working without flag protection. The engineman observed the gang while still at a considerable distance, and at a point about 1,400 ft. east of the gang, he began to sound the whistle and continued to sound it until after the accident. When 1,000 ft. away he moved the brake valve to emergency and had reduced the speed to about 30 miles an hour when he reached the gang. The train stopped with the locomotive only 800 ft. west of the point of the accident.

According to statements of the five survivors, eight of the men killed were tamping ballast with the pneumatic tie tampers. It had been the practice of the foreman to maintain a lookout and to warn the men of approaching trains. At the time of the accident, however, he was engaged in shoveling ballast, and did not assign any other employee to lookout duty. Evidently, the exhaust of the gasoline-driven air compressor and the noise made by the tamping tools prevented the men from hearing the approaching train. The five uninjured employees were not on the track at the moment of accident.

One of the Girders Mounted on Trunnions for Shop Welding

Refabricates 54 Salvaged Bridge Spans by Welding Methods

IN 1943 the Pennsylvania completed a new double-track relocation on its St. Louis division near Pocahontas, Ill., which required the construction of a double-track girder bridge of 13 spans over Big Shoal Creek, a similar bridge of 7 spans over Little Shoal Creek and a one-span double-track bridge over a highway. At the same time 12 girder spans were also needed to replace those in a bridge on the main line near Columbus, Ohio.

A number of girders 51 ft. long, were available from a double-track viaduct on the abandoned Park Place electric line in Newark, N. J. These spans were framed between cross girders and each pair of girders also had four intermediate cross frames and top diagonal lateral systems. The spans, however, did not have the requisite strength for service in the lines where they were needed, so it was decided to strengthen them by cutting off the ends, thereby reducing their length. This action was taken by the Pennsylvania in its efforts to reduce to a minimum the amount of new critical material required for these projects and to utilize available girders that otherwise would have been of no value other than for scrap.

Forty-one feet was selected as the proper length, although the economical span length for the bridges on the line relocation near Pocahontas was originally estimated as 56 feet. The selection of a 41-ft. length brought the stresses in the flange sections of the girders within the Pennsylvania specifications, which, for these bridges, is approximately equivalent to a Coopers E-76 rating for the locomotives now in use on the lines involved. No allowance was made for a reduction in section in computing stresses, because only girders that were in excellent condition, from the standpoint of corrosion, were selected for salvage and refabrication.

Materials for Victory

No. 12 of a Series

Faced with the problem of constructing bridges for which new steel could not be secured, the Pennsylvania salvaged 54 girder spans from an abandoned viaduct. This article describes how the ends of these spans were cut off to strengthen them for the required loading and how they were refabricated by welding

It was further planned to use salvaged steel for added stiffener, bearing, end-facing, sole and apron plates. This steel was secured from the webs and cover plates of the cut-off portions of the girders and from the webs and cover plates of the cross-girders which were shipped in with the spans when the viaduct was dismantled. To do this work, a contract was awarded a welding and refabricating company, which also included the cleaning and repainting of the converted spans. Electric arc-welding was used in all the welding work.

Old Girders Cut Apart

In removing the old viaduct, the cross girders at the ends of each double-track span and the girders of each span were cut apart by removing the rivets. One cross girder was shipped to the contractor with each of four 51-ft. girders, together with the cross frames and laterals for each pair of girders.

The refabricating and assembling of the 54 completed bridge spans entailed the handling of approximately 1,200 tons of steel. Approximately 3,000 lb. of steel for each span was salvaged and refabricated into stiffener, sole plates, bearing plates, and end plates. This resulted in utilizing over

160,000 lb. of critical steel from the salvaged material. The converted spans weigh about 17 tons apiece and the 54 spans weigh about 918 tons. This entire project was performed without the use of any new steel other than welding electrodes.

Special Shop Set-Up

The cutting off of the girder ends and the salvaging of the plate stock entailed considerable difficulty originally. However, special contrivances and procedures were developed which expedited the removal of the rivets and cutting through several thicknesses of steel plates. Special wide-gage trucks were designed to hold the girders at proper distances for reassembling, and a special wide-gage track was installed on which to run these trucks into the shop. The girders were handled on and off the trucks by electric hoists and were placed on trunnions to facilitate the welding work. This was done after the new end plates were welded in place. These trunnions were designed with open top, half round bearings.

The jigs which held the girders in the trunnion were made of plates punched to conform with holes punched in the new end plates and had a 3-in. pin welded to them, extending outward. The jig plates were bolted to the girder at each end and the pins were set in the half round bearing of the trunnions. This enabled each girder to be revolved 360 deg. around its longitudinal axis and permitted all weld applications to be made in a down-hand or flat position. Without the trunnion device, vertical or over-head position welding would have been required on most of the work, since each fabricated girder weighed approximately seven tons.

When the girders were welded, they were placed back on the wide-gage trucks and the cross braces and lateral bracing and gussets were welded in place. While the completed spans were still on the trucks, they were brush-painted with one coat of red lead and then spray-painted with black paint. The trucks were then rolled out of the shop and the spans loaded with an over-head crane onto a flat car and secured, ready to be transported and installed at their destination.

Welding Details

The various plates, after being cut from the girders in the rough, were sheared to size and notched. After all old paint and corrosion were removed, the pieces were comparable to new material. Most of the welds made were $\frac{3}{16}$-in. fillet welds. After each girder was cut to a length of 41 ft., removing five feet from each end, the ends of the web and angles were dressed preparatory to welding on new end plates. The end plates were 14 in. wide and $\frac{9}{16}$ in. thick, and were welded in place with a $\frac{3}{8}$-in. continuous fillet weld on each side of the web. They were also welded to the outstanding legs of the top and bottom flange angles with $\frac{3}{8}$-in. continuous fillet welds, and at the top to the end of the cover plate, with a continuous butt weld. Later, when the new sole plates were welded in place, the bottom ends of the end plates were welded to the sole plate with a continuous butt weld.

Reinforced Flange Rivets

While on the trunnions, the flange rivets were reinforced on both ends of the girders by welding the top and bottom flange angles to the web. This reinforcement was extended to a point about one-quarter of the length of the girder from the ends, using $\frac{3}{8}$-in. continuous fillet welds to the first intermediate stiffener and $\frac{5}{16}$-in. continuous fillet welds to the next intermediate stiffener. In reassembling the spans, two of the four cross frames were placed at the ends of the newly assembled girders and the other two were welded back in place about 10 ft. apart at their original locations near the center of the span. The outstanding legs of the stiffener angles at the cross frames were welded to the bottom flange angles of both girders.

Two new end stiffener plates $\frac{1}{2}$ in. thick were welded in place on each side at both ends of each girder. They were welded to the web and top flange of the girders with $\frac{3}{8}$-in. continuous fillet welds on both sides and to the bottom flange angles with a continuous butt weld. This work provided three stiffeners at the ends since the old stiffener angles, located $6\frac{7}{16}$ in. in from the point where the girders were cut, were left in place. The new stiffener plates were located $12\frac{11}{16}$ in. and $17\frac{7}{16}$ in. from the end of the web.

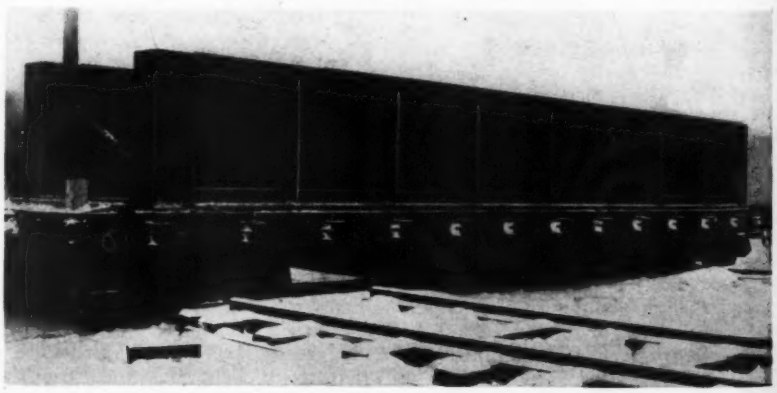
At the bottom of the girders, the second cover plate was cut away on each end to make room for a new sole plate, $\frac{1}{2}$ in. thick and 1 ft. 8 in. by 1 ft. 10 in., which was welded to the first cover plate with $\frac{3}{8}$-in. continuous fillet welds. The sole plate was also plug-welded to the girder through the old rivet holes in the bottom flange angles and cover plate. The first cover plate and flange angles were also welded together with $\frac{3}{8}$-in. continuous fillet welds at the ends of the girders to the point where the second cover plate had been cut.

Two $\frac{5}{8}$-in. plates were welded together for new masonry plates and both the masonry plates and sole plates were drilled for anchor bolts, with $1\frac{7}{8}$-in. holes for the fixed ends of the girders and slotted holes $1\frac{7}{8}$ in. by 4 in. for the expansion ends. After welding the masonry plates together, it was necessary to straighten them in a press.

In general, old rivet holes were not plug-welded except in cases where the welds were needed to increase strength or in locations where the old rivet holes might catch moisture, cinders, etc., and cause corrosion.

Installation

On the line change in Illinois, the substructure consisted of concrete gravity piers and abutments. These had been completed by the time the bridge spans were ready. The girder spans were shipped on flat cars to the nearest siding and trucked directly to the job on the highway. They were placed from the ground, using one crawler crane. Four and five spans were placed in this manner each day. After placing the spans, a reinforced concrete slab deck, 41 ft. long and about 12 in. thick, was poured in place. After the slab had cured, the bridges were ready for installation of the ballast and track structure.



One of the Refabricated Girders Loaded on a Flat Car and Ready for Installation

Burlington Tests Rail of New Design

A NEW 112-lb. rail section, with special features designed to obtain greater torsional and flexural rigidity than is found in present rail designs, while at the same time bring about more uniform distribution of stress throughout the section under all conditions of loading, is being laid in two sections of track on the Chicago, Burlington & Quincy. The two installations involve a total of approximately 5,000 tons of the new section. Through its features, it is expected that the new section will reduce the possibility of split heads, web failures and broken bases—in fact, serve to reduce, if not eliminate, failures due to fatigue of metal—while at the same time increasing the normal life of the rail under traffic.

Differs from RE Design

The new rail section, which is known as Torsion-Resisting (TR) rail, can be rolled in weights comparable to present A.R.E.A. designs, but, to date, only the 112-lb. section has been produced, and this alone for the installations being made by the Burlington. The new section differs from the 112-lb. RE section in a number of important respects, all of which are brought about by a re-distribution of the same amount of metal. As shown in Fig. I, the new section has an overall height of 6¾ in., compared with an overall height of the 112-lb. RE section of 6⅝ in; a re-designed web, thinner at the base but thicker at the top than the web of the 112-lb. RE section; and a head that is considerably narrower and somewhat deeper than that of the comparable RE design. More specifically in the latter regard, the TR 112-lb. rail head is 2½ in. wide, compared with a head width of 2-23/32 in. in the case of the RE section, and it is 1/16 in. deeper.

The top contours of both the TR and RE sections have a 14-in. radius, but are different in that while the 14-in. radius curve of the TR section head is flanked on both sides immediately by corner curves of ⅜-in. radius, and is identical in this respect to the service-tested 90-lb. RA rail, the head of the 112-lb. RE section introduces short sections of 1-in. radius curve between the top curve and the corner curves. In addition to this change in the contour of the running surface of the TR section and its narrower width, the sides of the head of the new section, at a point ¾-in. below the top at the center, are sloped inward toward the web, on a batter determined largely by considerations involved in the new web and head fillet design.

Unlike the 112-lb. RE section, the web of the 112-lb. TR section is substantially symmetrical, appreciably thinner than the web of the RE section at its base, and appreciably thicker than the web of the RE section at its top. More specifically, at a point 1.5 in. above the base, the web of the TR section is 0.757 in. thick, whereas the web of the RE section is 0.816 in. thick, and 4.75 in. above the base, the web of the TR section is 0.780 in. thick, while that of the RE section is 0.696 in. thick.

Between the web and the head, and a significant feature of the TR section, the fillet curve has a radius of 11/16 in., compared with a radius of ⅜ in. in the 112-lb. RE section. Likewise, the radius of the fillet at the base of the web of the TR section is larger, being ¾-in., compared with 5/8-in. in the RE design. Below the lower fillet curves, the bases of the two sections are similar. Other properties of the 112-lb. TR section, compared with those of the 112-lb. RE section, are shown in the accompanying table.

Advantages

A number of advantages are indicated in the new design. In the head shape, the line of wheel contact is brought closer to the center line of the rail, reducing strains in the web which are known to be caused by eccentric loading. Furthermore, in its head shape, resistance to bending and twist, caused by eccentric vertical and lateral loads, is increased.

In the larger head fillets and the redesign web of the section, it is expected that the concentration of stress

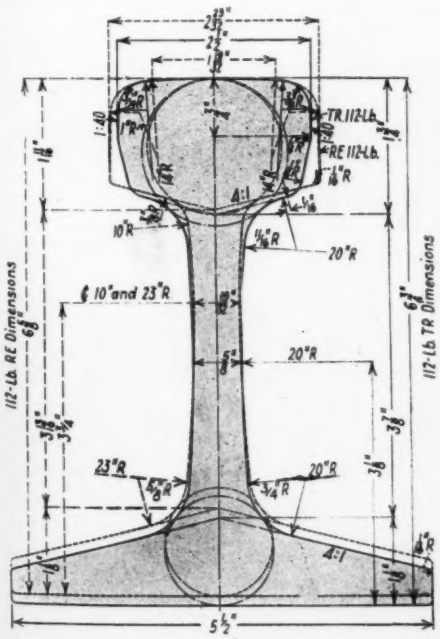


Fig. 1—Left—Shaded Area Shows Design Features of the New 112-lb. Torsion - Resisting (TR) Rail, in Comparison With 112-lb. RE Rail, Shown in Dotted Lines

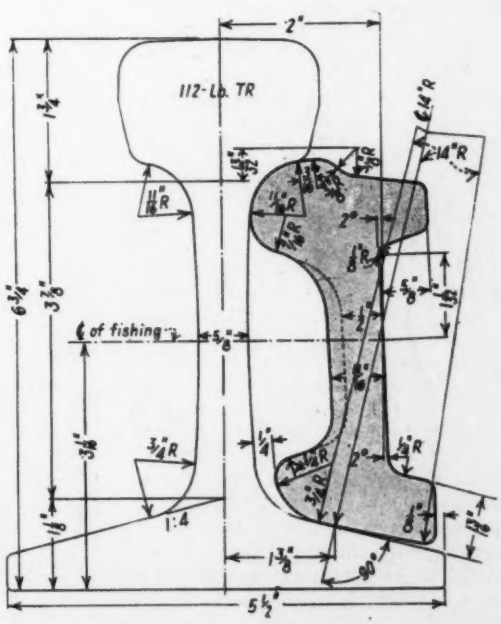


Fig. 2—Right—Shaded Area Shows Cross Section of New KM8 Joint Bar Applied to 112-lb. TR Rail

in the web and fillets will be reduced at least 20 per cent. At the same time, these features provide greater bearing for Headfree-type joint bars, which it is expected will result in reduced wear of the bars and a reduction in the possibility of nicked and cracked bars. Together, the shape of the head and web also produces increased vertical and lateral stiffness, which will serve to spread the load over a greater number of crossties, and which should thus reduce track maintenance costs.

In addition to the 112-lb. TR section, a new 128-lb. TR section has been developed, with advantages comparable to those described for the 112-lb. section.

Properties of TR and RE Sections

	112-lb. TR Section	*112-lb. RE Section*
Area of Head	3.78 sq. in.	3.95 sq. in.
Area of Web	2.94 sq. in.	2.77 sq. in.
Area of Base	4.29 sq. in.	4.29 sq. in.
Total Area	11.01 sq. in.	11.01 sq. in.
Moment of Inertia	67.0	65.5
Section Modulus, Base In.³	22.3	21.8
Section Modulus, Head, In.³	17.9	18.1
Weight per yard	112.3 lb.	112.3 lb.

Steel mills have advised that the TR sections are easy to roll and have good cooling properties. Furthermore, it is to be noted that through the use of TR rails for stock rails at switches, reinforced switch points of the Samson type can be employed without the special milling of the rails.

The new TR rail sections were developed by George R. Burkhardt, chief draftsman of the Burlington, in collaboration with The Rail Joint Company. Sales rights covering the new sections have been assigned to this company, which has developed new modified Headfree-type bars to fit the sections. The 5,000 tons of 112-lb. TR rail being laid by the Burlington were rolled with the permission of the War Production Board by the Colorado Fuel & Iron Company, employing modified existing rolls.

New Joint Bars

The new Rail Joint Company bar designed to fit the 112-lb. TR section is of the Headfree, toeless type, similar in general shape to one of the standard type bars manufactured by the company, but modified principally in fishing height and in the shape of its top fishing area to meet the conditions imposed by the new TR rail section. The particular bar being used in the Burlington's installation of 112-lb. TR rail is shown in Fig. II, where it is to be noted that it is 1/16 in. higher in fishing height than the comparable 112-lb. RE bar. Like other bars of this type, this bar offers a pyramid support for the rail, making contact with the upper face of the rail base and extending inwardly to contact with the head fillet of the rail. A feature of the bar, made possible by the increased radius of the head fillet of the rail, is its increased bearing area in the head fillet, which should result in reduced wear of the bar. Another feature of the bar is its curved base, of 14-in. radius, which insures initial bearing well in on the base of the rail.

Rail Output in 1942 Highest in Last 12 Years

RAIL production in the United States in 1942, stimulated by the increased needs of the railways, the army and navy, war industries and lend-lease, was greater than in any year since 1930, according to figures published in the recent annual statistical report of the American Iron and Steel Institute for that year. The rail output in 1942 was 2,096,159 net tons, which was 168,308 tons greater than in the previous year, and 1,645,285 tons, or nearly five times, larger than the 450,874 tons produced in 1932, the low point of the depression. High as the production was in 1942, it is of interest to note that it was still far below the production in any of the years 1925 to 1929, in all of which years production exceeded three million tons, reaching 3,603,767 tons in 1926.

Study of the accompanying table, which shows the rail production by weight groupings for the years 1925 to 1942, inclusive, shows that the increase in production as compared with 1941 was confined to three of the six weight groupings, and that in the three others the output actually declined. Rather surprisingly, the largest increase, both relatively and actually, occurred in the weight group including sections over 60 lb. and less than 85 lb. per yard. In this classification, the increase was 160,712 tons, or 135 per cent. Possibly due to wartime developments, the production of rails in this category was far above the level that prevailed during the immediate pre-war years, having jumped from 20,013 tons in 1939 to 114,666 tons in 1940, and to 279,414 tons in 1942.

In the weight group embodying sections weighing 100 lb. and less than 120 lb., the output in 1942 increased 104,156 tons over 1941, or 12.7 per cent, while the production of those sections weighing 120 lb. and less than 136 lb. showed an increase of 9,312 tons, or 2 per cent.

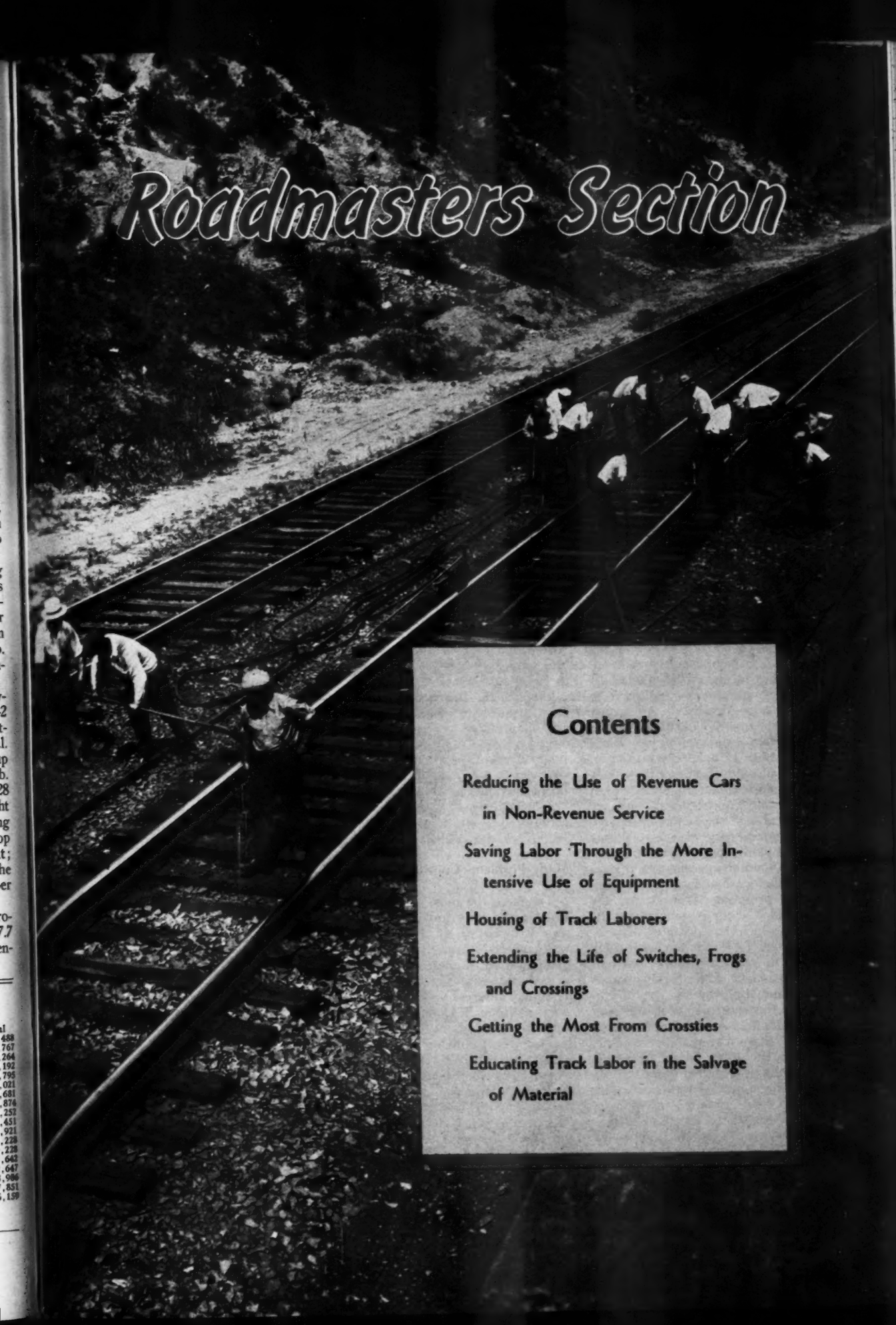
In the three classifications showing decreases in production in 1942 as compared with 1941, the percentage drop in output was substantial. For instance, in the weight group including sections weighing 136 lb. and over, the decrease was 12,428 tons, or 23.8 per cent; in the weight group embodying sections weighing 85 lb. and less than 100 lb., the drop was 46,118 tons, or 22.5 per cent; and in the 60-lb.-or-less group the decrease was 47,326 tons, or 27.5 per cent.

Of the total tonnage of rails produced in 1942, 2,048,723 tons, or 97.7 per cent, were rolled from open-hearth steel.

Production of Rails by Weight Per Yard—Net Tons

Year	60 lb. or less	Over 60 and less than 85 lb.	85 and less than 100 lb.	100 and less than 120 lb.	120 and less than 136 lb.	136 lb. and over	Total
1925	*183,240	†246,006	857,215	----------	1,833,027	----------	3,119,488
1926	*220,931	†287,041	893,382	----------	2,202,413	----------	3,603,767
1927	*181,255	†194,048	604,178	1,472,155	691,627		3,143,264
1928	*150,301	†140,813	521,240	1,348,199	804,639		2,965,192
1929	*158,326	†115,297	458,783	1,381,631	934,758		3,048,795
1930	*107,101	† 91,055	300,024	935,756	664,085		2,098,021
1931	* 56,100	† 28,587	138,206	555,242	518,546		1,296,681
1932	* 18,654	† 15,350	32,024	240,902	143,944		450,874
1933	55,010	17,263	45,890	172,488	175,601		456,252
1934	78,495	19,164	82,476	550,639	365,055	35,622	1,131,451
1935	63,982	16,529	95,902	381,696	172,891	65,921	796,921
1936	107,644	23,629	111,956	684,910	412,687	25,402	1,366,228
1937	113,889	92,219	126,155	815,280	436,698	34,987	1,619,228
1938	50,375	27,627	57,550	371,534	188,034	2,522	697,642
1939	92,994	20,013	63,598	620,992	480,675	34,375	1,312,647
1940	140,443	114,666	225,006	688,109	486,716	24,046	1,678,986
1941	172,264	118,702	205,266	820,695	558,545	52,379	1,927,851
1942	124,938	279,414	159,148	924,851	567,857	39,951	2,096,159

*Under 50 lb. per yd.
†50 and less than 85 lb. per yd.



Roadmasters Section

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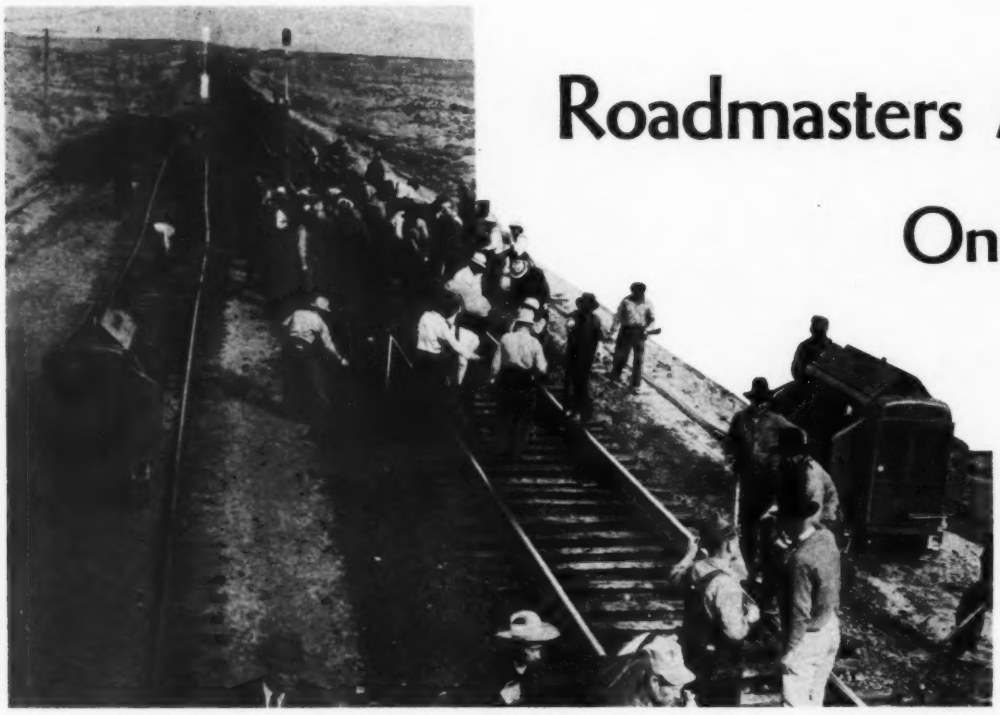


With Largely Increased Programs and Responsibilities, Roadmasters Have Stayed Unusually Close to Their Work This Year

DETERRED by war conditions from holding its regular three-day annual convention, which was scheduled to convene in Chicago on September 14-16, the Roadmasters' and Maintenance of Way Association substituted an intensive one-day business meeting of its officers and directors in Chicago on September 15, where, with the aid of the chairmen of most of its technical committees and a number of key members and guests, it gave detailed consideration to the reports prepared for presentation to the association, discussed many special problems confronting maintenance men as the result of the war, and set up a constructive program of work for the year ahead. The total attendance at the meeting, which was presided over by President E. L. Banion, general track foreman on the staff of the assistant general manager of the Eastern Lines of the Santa Fe, was 48.

It was the fourth time in the long history of the association, now 60 years old, that its annual meeting was cancelled, the other years in which no conventions were held being 1931-1933, in the depth of the depression. On every hand, among both officers and members, there was keen disappointment that conditions made it appear inadvisable to hold a full meeting this year, especially in view of the increased problems and responsibilities confronting the track forces, with the correspondingly larger benefits that would have accured from such a meeting through the opportunity which it would have afforded to visualize the problems ahead and for the free exchange of ideas and experiences. However, to the end of not adding to the burden of the already heavily burdened passenger trains of the country, and fearful that the heavy responsibilities of members might prevent the attendance of many of them at a regular meeting, the officers and directors decided upon the one-day open session of the Executive committee as the most effective substitute for the annual meeting.

Many Problems Considered

To make the most of the one-day session, the program of the meeting was stripped of all formalities and was confined throughout to detailed consideration of the technical reports of committees and to other questions of timely interest and importance to track maintenance officers. The technical reports submitted, which are presented on following pages, together with abstracts of the discussions which followed their presentation, dealt with the following subjects: Saving Labor Through the More Intensive Use of Equipment; Getting the Most From Crossties; Housing of Track Laborers; Extending the Life of Switches, Frogs and Crossings; Educating Track Labor in the Salvage of Materials; and Reducing the Use of Revenue Cars in Non-Revenue Service.

A significant feature of the program, indicating the keen desire of roadmasters to seek answers to their special problems, was an informal roundtable discussion which developed late in the afternoon, during which a number of questions, beyond the scope of the reports, were raised and discussed. Some of these special questions dealt with the complaints of certain mechanical officers that some self-guarded track frogs were damaging wheels and locomotive tires; whether it is essential that rail laying and out-of-face surfacing on live double track be carried out against the current of traffic; the most efficient methods of coping with weeds on the right of way; and how to secure essential track labor under the existing widespread shortage of manpower throughout the country? Abstracts of the discussions of these questions form a part of the following report of the meeting.

Officers Hold Over

Barred by the constitution of the association, except at annual meetings, there was no election of officers, and the present officers will continue to serve until the next regular annual meeting. Likewise, there was no exhibit of track materials and equipment by the Track Supply Association, a feature that for many years has formed an important supplement to the regular meetings of the association. However, a number of members of the Track Supply Association attended the meeting to show their in-

The Most Of War-Time Executives Meeting

E. L. Banion
President

Officers, supported by key members, discuss and release reports and select subjects for investigation in the year ahead.

terest in the activities of the roadmasters, and Lewis Thomas, secretary of the association, speaking briefly in behalf of its members, congratulated the roadmasters for carrying on so aggressively during the present trying times. He also expressed regret that it was deemed inadvisable to hold a regular convention this year, accompanied by an exhibit.

President Banion Comments

In brief presidential remarks, President Banion reviewed the action of the Executive committee in abandoning the annual meeting this year, pointed with pride to the work of the association over the years, and urged members to continue their support of the association in the difficult days ahead. He said, in part, as follows:

"For the fourth time in the long history of the Roadmasters' and Maintenance of Way Association, extending over a period of 60 years, we have found ourselves confronted with the necessity of postponing our annual meeting. At the July meeting of the Executive committee of the association, it was decided that it would be unwise to carry out our usual type of convention. All of the many factors involved were considered, and the decision to defer our annual meeting was not an easy one. It was the general opinion, however, that it would not be wise at this time to add a further burden to the already overtaxed passenger carrying capacity of the railroads; it was the further thought that many of our members would not find it possible to attend our meeting owing to the heavy responsibilities that the present crisis has placed upon them. Only time will show the wisdom of this decision.

"Reviewing the proceedings of the association for previous years, it is gratifying to note the results accomplished by our committee work and the discussions that followed the presentation of committee reports. It is interesting, too, to note the many instances wherein the practices recommended have since come into general usage and are our standard plans for the future. Through our association activities, many maintenance problems have been solved in a manner that has proven both practical and economical.

"During the last two years, in the face of many difficult maintenance problems, a remarkable record has been made in keeping the roadway and track up to the high standard necessary to handle the present greatly increased volume of traffic safely and efficiently. Wherever possible, the falling off in our track maintenance manpower has been met with machine methods to release men for more important work. Railway supply companies have done much to help us meet this situation by supplying the necessary power tools and equipment. The close co-operation between these companies and maintenance men has made it possible to solve many of our problems to the mutual advantage of both parties. We must continue the outstanding work of our association, and this close co-operation with our friends in the railway supply field."

The secretary's report showed a total membership in the association of 812, an increase of 18 during the year, and the treasurer's report showed the association's finances in a favorable condition.

During the closing hour of the meeting, the Executive committee selected the following subjects for study during the ensuing year: Operation and Maintenance of Work Equipment; Effects of Traffic on the Service Life of Ties and Methods of Protection; Prevention of Accidents to Trackmen; Mechanization of Section Gangs; What the Trackman Can Do To Speed Up Train Operation; and Recruiting Men in a Period of Extreme Labor Shortage.

At a meeting of the Executive committee scheduled to be held early in November, the personnel of committees to investigate and report on these subjects will be selected from those who volunteer to carry on the work.

Roadmasters' Association

Officers 1942-43

E. L. Banion, president, general track foreman, Eastern lines, A.T. & S.F., Topeka, Kan.

H. E. Kirby, first vice-president, assistant engineer, Chesapeake & Ohio, Richmond, Va.

J. M. Miller, second vice-president, assistant superintendent, Western Maryland, Cumberland, Md.

Elinor V. Heffern, secretary, Chicago.

E. E. Crowley, treasurer, roadmaster, D. & H., Albany, N.Y.

Directors

E. J. Brown, engineer of track, C.B. & Q., Chicago.

S. J. Hale, assistant superintendent, N. & W., Roanoke, Va.

R. L. Fox, roadmaster, Sou., Alexandria, Va.

Ray Marshall, district roadmaster, G. N., Superior, Wis.

A. L. Kleine, division engineer, D. & R.G.W., Grand Junction, Colo.

F. J. Meyer, chief engineer, N.Y.O. & W., Middletown, N.Y.

A. B. Chaney, district engineer, M.P., Little Rock, Ark.

F. E. Schaumburg, roadmaster, C. & N.W., DeKalb, Ill.

Reducing the Use of Revenue Cars in Non-Revenue Service

Report of Committee

J. M. Miller
Chairman

THE subject assigned to your committee deserves the closest attention of every maintenance man who has anything to do with the loading and unloading of company materials. Although company material moving in revenue cars, as reported to the Association of American Railroads, comes under three general classifications, (1) coal and coke, (2) company material in tank cars, and (3) all other company material, your committee will deal principally with the latter, as it is this class that we are primarily interested in. The demand for open-top equipment such as is generally used in maintenance work is, at this time, very critical. While the supply of all classes of equipment is tight, actual shortages of flat and gondola cars are reported in various parts of the country. As cars of these types are required for the movement of war materials, shortages here reflect a hindrance to the war effort.

It is needless for us to emphasize the part that the railroads are playing in the war effort other than to recall that the delay of even one car unnecessarily may delay the movement of a war material that may be urgently needed. The best effort of all of us is therefore required, and in this point of view there are no options.

The record of revenue cars held under load with company material on the days shown in the accompanying table, taken from the records of the Association of American Railroads, indicates the extent to which revenue cars are used in company service.

Number of Revenue Cars Held Under Load With Company Material as of Dates Shown, 1943.

Grand Total All Districts U. S. Roads	Coal & Coke	Company Material In Tank Cars	All Other Company Material	Total Cars All Company Material On Hand
	No. Cars On Hand	No. Cars On Hand	No. Cars On Hand	
Jan. 15	38140	2096	8813	49049
30	36020	1991	8960	46971
Feb. 15	36846	2034	9749	48629
28	38939	2311	10204	51454
Mar. 15	39359	2025	10160	51544
31	43897	2040	9078	55015
Apr. 15	49794	2089	9195	61078
30	51824	2226	9857	63907
May 15	47559	2263	9274	59096
31	48557	2287	10703	61547
June 15	41036	2429	10180	53645
30	37900	2393	10857	51150
July 15	40048	2234	10425	52767
31	37485	2069	9672	49226
Daily Average on hand	41957.5	2177.5	*9794.5	53934
Percentage of Total	77.8	4.0	18.2	100

*—Detention—1 to 15 days.

This record shows the number of cars loaded with company material that were held on the dates indicated during the first seven months of 1943. It will be noted that there were on hand an average daily total of 9,794.5 cars loaded with company material, exclusive of coal and coke and company material in tank cars. These cars were 18.2 per cent of the total cars so held. In examining the records of the Car Service division of the association, it is noted that the detention of these cars varies from one to fifteen days. It is not to be supposed that the total number of cars so indicated are held either for the minimum of one day or the maximum of fifteen days; yet it is noted that one large railroad has seen fit to hold approximately one-tenth of the cars included in the above figures more than the average days of detention. Another railroad averages ten to eleven days detention with a substantial number of cars involved. The most extreme case that has come to the attention of the committee is one railroad, which during these seven months, held cars for an average detention of thirty days. We believe this to be an extreme case and not representative of the whole. In many cases, however, we find the average detention running from four to six days, which is too high. It is frequently said that if the railroads were placed on the same basis as private industries, an immediate decrease would be noted in the average detention.

As ballast and crossties constitute the largest loadings of company materials in revenue cars, every effort should be made to unload these cars with the least possible delay in order to return the cars to revenue service. With the co-operation of the shippers, the operating department and the maintenance of way department, it is apparent that these cars should be released promptly and with a minimum of delay.

Using Cars for Storage

At this point, the age-old question arises as to the using of cars for storage purposes instead of unloading them immediately upon their receipt. The records in this respect are bad, and there is reason to assume that this practice contributes most to the delay of cars. It is realized, of course, that in at least some cases, it is difficult to avoid the use of cars for storage. But this is all too often an excuse and without merit, if proper planning is done. Checks made by car service agents have uncovered numerous instances of scrap and wreckage being picked up at outlying points and moved to central points where they are held for long periods awaiting disposition. This practice can hardly be defended at this time in view of the fact that this material is needed so badly at the steel mills. At other points, shipments of new materials have arrived at storage houses and have been permitted to remain in the cars indefinitely because of the lack of understanding of the need for these cars elsewhere. Further, these checks have also indicated that in many cases ballast is ordered too far in advance of requirements, and in other cases, more is ordered than is required, and the surplus is left in cars for periods which are beyond reason.

The railroads are compelled to use revenue cars for the transportation of much of their material, but if these cars are loaded only when it is known that the material loaded can be disposed of promptly, or that ground storage can be provided for slow

moving items, such as scrap iron, rails, wheels and ties, the number of cars saved would be surprising. Flat cars for the movement of tanks, trucks and other war material, to say nothing of army division movements which demand upward of 1500 flat cars per division, are so scarce that any unnecessary use or delay should be considered an unpardonable offense. Gondola cars, which were plentiful before the war, are now used for loading heavy war materials at various points, moving largely to the Pacific coast, and also for a large percentage of the ore moving from the lower lake ports to inland furnaces. The supply of these cars is now so limited that there is imminent danger of it becoming necessary to stock pile steel products at the mills and to store ore at the docks. Either of these expedients would be a calamity. In view of the fact that maintenance materials can be handled more readily in open-top equipment, it must be recognized and fully appreciated that the least possible delay to this class of equipment constitutes the best contribution to the war effort that can be made by any individual who has anything to do with the loading, unloading or delaying of this material.

What Can Be Done About It?

Whenever a different class of equipment can be substituted for open-top equipment, it should be done. This, in some cases, may appear to be of some handicap, but one will find that some substitutions can be made without delay or inconvenience, and some inconvenience is warranted by present conditions. Items like spikes, bolts, tie plugs, etc., can and should be loaded into Class C or rough freight box cars or stock cars. Some railroads have company service cars for use in forwarding frogs, switches, and such other supplies as are normally forwarded from the store house to section headquarters periodically. It is hardly probable, however, that ballast and crossties can be loaded in equipment other than that now being used.

If a definite program is first prepared of the requirements and this is then followed up by close co-operation between those purchasing, loading and disposing of the material when it is received, marked improvement will be noted. In many cases, company material is not moved promptly by the operating department, but used as fillouts in tonnage trains. If company material would be given the same status as other freight, many car days would be saved.

It is also a fact that in many cases company material is ordered and sent

Cars Used in Company Service Must Be Loaded and Unloaded Promptly

to a central location or yard, in which further delay is experienced, whereas if these cars were billed to the point at which they are to be unloaded, further car days would be saved.

Conclusions

There is no general rule to guide us in our efforts to reduce the use of revenue cars. We all face different problems, many of which are based on local conditions, including shortages in labor, cars, materials, or work train service. For the most part, the railroads are endeavoring to reduce the use of revenue cars in company service, if for no other reason than simple economy. To the end that a further reduction in car days can be accomplished, we offer the following recommendations:

(1) Make a complete plan of the work you want to do, the materials needed, and the time when they are needed. Discuss this program with your purchasing department a sufficient time in advance to enable it to determine if the materials required can be procured at the time required, and plan your work accordingly.

(2) Keep in close contact with your purchasing department and it with you, and have a complete and thorough understanding between the shipper, who should supply you with shipping notices, and the operating department, while the material is in transit.

(3) Point out to the operating department the advantages of prompt movement of the materials for which you have need and which are under load, and follow these cars from their point of origin, particularly if on your line, through to destination.

(4) Have your work so organized that you will be ready for the materials at the time they are received.

(5) Unload them promptly and without delay.

(6) Never use cars for storage purposes unless there is no alternative.

J. M. Miller (chairman), asst. supt., W. M., Cumberland, Md.; J. B. Kelly (vice-chairman), gen. rdm., M. St. P. & Sau. St. Marie, Stevens Point, Wis.; C. P. Nicholson, asst. ch. engr., Nor. Sou., Norfolk, Va.; E. J. Brown, engr. trk., C. B. & Q., Chicago, Ill.; G. W. Mehaffey, asst. supvr., Sou., Dalton, Ga.; S. J. Hale, asst. supt., N. & W., Roanoke, Va.; W. E. Amburgy, trk. supvr., C. & O., Mt. Sterling, Ky.; W. O. Frame, div. supt., Ft. W. & D. C., Wichita Falls, Tex.; G. L. Sitton, ch. engr. m. of w., Sou., Charlotte, N. C.; C. B. Wilkes, trk. supvr., C. & E. I., Villa Grove, Ill.; R. B. Yost, trmstr., A. T. & S. F., Chillicothe, Ill.; and J. A. Rust, rdm., Sou., Winston-Salem, N. C.

Discussion

A. B. Chaney (M. P.) suggested that arrangements be made for the yard office, the car distributor and others concerned in the movement and delivery of cars containing company materials, to notify the consignee of the expected arrival of these cars, for one of the sources of delay is that, unless the roadway forces have reliable information about the arrival of materials, they are not in position to make arrangements for unloading until after the car has been delivered.

The Great Need for Flat Cars Demands their Prompt Return to Revenue Service

President Banion cited cases where cars had been on hand as long as two weeks because the consignee had not been notified of either the shipment or the arrival of the car. N. D. Howard *(Railway Engineering and Maintenance)* urged more intensive consideration of this subject, and said that the statements contained in the report constituted an indictment of some maintenance of way men and of the interest they have taken in the prompt release of cars for revenue service.

Paul Mueller (C. & W. I.) described an arrangement he has devised, whereby he is notified immediately of the arrival of a car of company material at any point on his district. R. H. Gilkey (C. of Ga.) stated that he receives daily consists of trains containing cars of company material, and that with this advance notice he is able to make arrangements for the unloading of the cars, in advance of their arrival.

E. E. Crowley (D. & H.) called attention to the fact that all of the delays incident to the unloading of company material cannot be blamed on the road department, for, frequently, the stores department or other shippers fail to notify the consignee of the shipment, with the result that the first thing he knows about its having been in transit is when he finds it on hand. He said that on the Delaware & Hudson a daily report is sent to the roadmaster and the division engineer, showing all cars of company material on hand. The roadmaster makes a weekly report showing all material unloaded, the date of arrival of all cars and the date of their release. At outlying points, he said, it is not uncommon for cars to arrive without notice, and although the agent generally gives notice of the arrival, there is usually some delay in releasing the car.

F. E. Schaumburg (C. & N. W.) cited instances where cars were loaded by the stores department with material for several points, with the result that, when the car arrives at the first point, the foreman has no information about what material is intended for him and the car is delayed until this information can be secured. Then the second or some succeeding foreman lacks the same information, with the result that the car is delayed unreasonably. To correct this condition, arrangements have been made for the stores department to segregate, so far as practicable, the items for each section and to tack a card inside the door giving a list of these items. The stores department also gives notice when the car is loaded, so that the consignee knows when to expect it.

Mr. Crowley also called attention to the fact that agents or yardmasters must be notified immediately of the release of cars or they will continue to be charged to the consignee as under load. Mr. Howard also called attention to the desirability of loading cars of types that are plentiful, rather than to use those that are in greater demand at the time.

Saving Labor Through The More Intensive Use of Equipment

Report of Committee

R. H. Gilkey
Chairman

THIS subject is most timely. We have never before been confronted with a labor situation such as that which prevails now. In many parts of our country it is very critical. Track and structure maintenance is more important than ever before. The demands of war traffic are exacting. Our primary concern, however, is undoubtedly the shortage of track labor. The Selective Service continues to draw on our forces and in many areas war factories and ship yards are taking both key men and laborers.

We must face this problem and carry on our work regardless. Maintenance officers must devise new methods, new schemes, better tools, and more machines must be used in order to accomplish our tasks, in order that the railroads can continue to be an effective arm of this nation.

Work must be performed with less man-power, and for that reason mechanized labor-saving devices must be considered for each job. We all realize that the only substitute for man-power is machine power and that very often these machines will do better work than can be done manually. Jobs often require so many man hours when performed manually, that during this labor shortage, such work is only half done or is left entirely undone. Therefore, if our forces are given sufficient power machines and power tools, they will be able to perform their work in such volume and quality as to meet the required standards.

Several years ago, during the depression, maintenance forces were greatly reduced, revenues were less and money was scarce; yet the tracks had to be kept in a safe state of repair. Most roads already had good supplies of power tools and they soon realized that they were able to carry on by the more intensive use of these tools and machines.

Today, the tempo of all things has increased. Faster train schedules are in effect and traffic is moving with record speed. The labor available in all areas is less than a year ago; yet our tracks must be maintained to higher standards in order to carry important war traffic.

Keep Machines Working

To meet this situation we must make the most of the power machines we already have and add more machines as fast as they can be purchased. *Idle machines* bring no return. Rather, they deteriorate and take up space. A definite number of days' service can be expected from each machine; to obtain the maximum service, the tool or machine must be serviced regularly, must be handled with ordinary care and maintained in such a manner that

parts are replaced before the whole machine breaks down. The desired results can be obtained only by keeping the machines in continuous service in productive work.

In order to keep the machines working continuously, work must be planned in advance. Unless this is done, many machines will remain idle. The work must be scheduled. A great deal of track work is seasonable and must be done at certain times, while other work can be done at any time. Therefore, a machine that is used in seasonable work can probably be equipped with certain accessories and used on off-season work. This will keep the machine busy at all times. Also, in moving from one job to another, the programming of the work to be done will save long jumps and certain idleness.

Abuse of the machine, lack of lubrication, rough handling or indifference of the operator soon cause the power plant to fail. Certain adjustments of equipment and inspection must be made regularly in order that failure of any part may be detected in time and thereby avoid a delay to the work as well as delay in overcoming a costly failure.

Maintenance and Supervision

The maintenance and repair of equipment to avoid delay on the job are most important. Certain spare parts should be kept either at a central point or by the operators. Do not wait until the plant fails before obtaining the necessary parts. Repair parts should be checked to know what is on hand, and should be kept in good condition. If it is possible to repair parts by building up the worn sections or otherwise tooling them, this should be done and the parts so repaired should be kept ready for use. Parts beyond repair should be scrapped. Whenever relief machines are sent out in replacement, the old machines should be put in serviceable condition at once.

Man failures play a big role in slowing down production. Machines may have defective materials or be of poor design, or just wear out, but back of most of this are man failures. The operator may be indifferent or careless or be so absorbed in his work and in the progress of the job that he overlooks the power machine at his command.

The centralizing of supervision must not be overlooked. Usually the track supervisor on the district has direct charge of the equipment, and it is his duty and responsibility to know the tools and machines. The operators look to him for parts and repairs and he looks to the operators for the amount and quality of the work performed. The supervisor should devote a certain amount of time to the study of the machines on his district and determine whether the operators are giving them proper care and maintenance. Frequently, in his desire to keep a machine at work on his own territory

Proper Operation and Maintenance Will Increase the Output of Machines

all the time, a supervisor may neglect its maintenance and send it to another supervisor in a bad state of repair. The more knowledge that the supervisor and operator have of the machine, the better will be its performance. The supervisor should spend some time with each machine, discuss any trouble that may develop with the operator and take steps to correct it. Both supervisor and operator should take an active interest in the equipment and power tools.

The operator, who is in constant touch with the machine, should know its capacity and needs better than anyone else, and be better qualified to handle it and obtain good results without unnecessary breakdowns. Some operators handle their machines roughly, but obtain good results by good maintenance. Others handle their machines carefully, but obtain inefficient work because of poor maintenance.

Beyond the operator, the next very important man in this field is the maintainer or field mechanic, who all too often does nothing until trouble develops. He should make periodic inspections of all machines and discuss their upkeep with the operators, in order to keep the units running. Sympathetic co-operation between operators, supervisors and repair men is needed constantly if full performance is to be obtained.

During the long daylight hours of the summer months, many machines, such as mowers, discers, ditchers and burners, can be operated longer periods by extending the work day to 10 or 12 hours. Draglines, bulldozers and other off-track equipment engaged in bank widening, grading and similar jobs, can be placed on double shift; other machines can be worked from two to four hours overtime each day. If jobs are short, with frequent moves, it is probably better to work overtime than to work two shifts; on jobs of longer duration, it is probably better to double-shift. On coal storage or in ballast pits, it is very desirable to work two ten-hour shifts, which will allow some time to service the machines.

Section Gangs

Up to the present time, section gangs have not been equipped with many power tools but have had to get along with motor cars and ordinary hand tools. It is probable that in the near future, such gangs will be equipped with the smaller types of power tools, such as spot tampers, track liners, pressure oil sprays, small power mowing machines and portable burners.

By the use of spot tampers of the two- and four-man, off-track types, the work can be so done that it will last longer between general surfacings, and the cost of labor will thereby be reduced.

Track liners are inexpensive and track lining can be accomplished better and with half the labor force.

The pressure oil spray of the one-man type is very effective in spraying and oiling joint bars.

The portable one-man type burner is an efficient unit to use in yards, around and about switches, along walkways and in other places hard to get at.

The small power-driven mowing machine (off-track) is a great labor saver and can be used instead of scythes and swingers, cutting grass and weeds between tracks, between rails and along walkways and paths where switchmen walk. This machine is suited especially for yard work; the cost of operation is low and the saving in man-power is large.

Extra Gangs

Extra gangs usually work on the larger jobs, such as laying rail, ballasting, constructing tracks, lining curves and general surfacing of track where a substantial lift is to be given. These gangs must be

equipped with those power tools which best suit their particular classes of work. Rail laying gangs should have power rail layers, drills, saws, tampers; in fact, any task where power can be used effectively will make a good saving in labor. A ballast gang, consisting of a foreman, an assistant foreman and 20 men, with a four-tool tamping outfit, will do efficient work. The main objective is to keep the power tools operating at all times.

Supervisors' Equipment

Supervisors' districts usually include from 100 to 200 miles of tracks, depending upon the amount of traffic and the character of the road, the supervisor having charge of the regular section gangs, one or two extra gangs, and such construction work as falls within his district.

There are many labor-saving tools that the supervisors can move from one section to the other by using each section foreman as the operator, or by placing the various units in charge of one operator.

Mowing machines of the type that can be operated by three men, one to operate the motor car that pulls the mower and the other two to operate the mower, right and left sides, are very effective and can operate over a supervisor's district, giving the road a clean cutting with two operations. This allows the section men to work on the track continuously, instead of devoting some of their time to cleaning the right of way.

There are several types of good power wrenching machines, the larger of which is operated by a small gang over the main line, while the smaller type is operated by two men. Either type is good and enables all bolts to be kept tight, removes all rusted bolts and aids in renewing cracked angle bars, thereby eliminating the necessity for section forces tightening bolts.

Small type weed burners can be operated with two men, one to run the motor car that pulls the burner and the other to operate the burner. This equipment is designed for use especially on side, yard and passing tracks, running down one rail, then back on the other, and finally between the tracks and rails. This machine can be taken off the track and it does not require a large force of labor to follow it, extinguishing burning ties and right of way. The supervisor in charge can pick his time to do the burning, depending upon train schedules and weather.

A division usually consists of 300 to 1,000 miles of tracks, depending upon the density of traffic and the character of the country traversed. The larger machines are used on such territory according to the needs.

The operation of spreaders over the track once each year will open up ditches and rebuild banks.

The operation of large weed burners or chemical weed destroyers over the main tracks during the fall will clean tracks of vegetation and put them in shape for the winter.

Off-track draglines or shovels help do grading, bank widening, ditching, bridge filling and similar jobs.

The bulldozer is of untold value in leveling off areas, or grading for new tracks. It is a new one-man machine and does the work of many laborers.

Side-dump ballast cars are essential in unloading and distributing ballast, and thereby save distribution by hand or push cars.

More Maintenance—Less Repair

Our number one problem is, of course, the shortage of labor. Conditions are more acute in certain territories than in others; the competition of higher pay in government plants, ship yards and other private industries, and the Selective Service, have drawn heavily upon our forces. The labor we have been able to hold is good, but the new labor is not as efficient and the field from which to draw machine operators is small. New operators must also be educated in the use of machines on the railroad.

More Maintenance in the Field Will Minimize Time-Consuming Repairs in the Shop

Each job will have to be analyzed and if a power tool or machine can be used, it should be utilized.

The supply of skilled workers is becoming smaller and this trend will continue and become more widespread. The best step we can take is to utilize all the power equipment we can get and keep what we have in good condition.

Some gangs are well supplied with tools while others are short of them. As the necessity arises, it is the responsibility of the supervising officer to supply his gangs with the proper tools.

All machines must have *more maintenance and less repair*. It is important that power tools be operated properly, all bolts kept tight at all times and the best lubrication given. No tool will perform efficiently unless given regular and careful attention.

Need More Equipment

The railroads need more good power machines of correct design to get the greatest amount of work done in the least amount of time. It is highly important to study each job for if a power machine can be devised that will hasten the work and release labor for other work, the result will be a substantial saving in labor.

This year the regular section gangs have lost man-power, and, to offset this, small portable compressors will have to be provided to operate spike drivers, tampers, wrenches and similar tools. A more uniform class of work will also result. Most of the work equipment can be adapted to the smaller gangs and it is our problem to study each feature of track maintenance to see if some power tool or machine can be used instead of hand methods.

Off-track equipment is needed more today than ever before, not only because other equipment is needed in revenue service but also because of the loss of time incurred in getting to and from work and of clearing trains.

In laying rail the entire operation can be done with the proper power tools, from the removal of the bolts and spikes, laying the new rail, adzing the ties and placing the new bolts and spikes, to picking up the old rail.

For restoring embankments, opening ditches and all kinds of drainage work, a wide variety of off-track equipment is available. Most of this can be adapted for use on the railroads.

Drainage is one of the necessary prerequisites to safe track. Weeds and grass must be kept out of the ditches and off the roadbed. Such machines as graders, ballast cleaners, spreaders, ditchers and crawler-

cranes should be used extensively. These machines do not require a large complement of labor.

During the next year there will be new ideas and new designs in machines and tools. Many labor-saving devices will be created, and where these machines and power tools are placed in section gangs, such gangs will effect economies that justify their assignment. In conclusion, we repeat that the intensive use of such equipment will yield large savings in labor.

Committee—R. H. Gilkey (chairman), div. engr., C. of Ga., Savannah, Ga.; A. L. Kleine (vice-chairman), div. engr., D. & R. G. W., Grand Junction, Colo.; M. R. Black, insp. of safety, L. & N., Lexington, Ky.; M. D. Clark, engr. m. w. & s., P. & N., Charlotte, N.C.; M. H. Dick, eastern editor, *Railway Engineering and Maintenance*, New York; F. A. Eastin, trk. supvr., C. & O., Peru, Ind.; R. L. Fox, rdm., Sou., Alexandria, Va.; A. M. Loveless, trk. supvr., C. & E. I., Chicago Heights, Ill.; W. C. McCormick, rdm., Seaboard, Savannah, Ga.; W. Rambo, div. engr., M. P., Nevada, Mo.; C. W. Russell, rdm., Sou., Greenville, S.C.; G. K. Sterling, rdm., C. & N. W., Eagle Grove, Iowa; and C. Weiss, trk. supvr., Penna., Valparaiso, Ind.

Discussion

A. B. Chaney (M.P.) inquired as to the extent to which steel tires can be substituted for pneumatic tires on off-track wheeled equipment. Chairman Gilkey replied that his road is changing over from rubber to steel as the pneumatic tires are worn out, and has recently purchased some equipment with steel tires. President Banion said that he has changed over to steel tires on compressors for spot tampers, and his experience indicated that it makes little difference which type of wheel is used. E. E. Crowley (D&H) mentioned that farmers are finding it necessary to make this substitution, and that they are finding, in some cases, that the steel wheels are of advantage because they can be fitted with cleats.

Elmer T. Howson *(Railway Engineering and Maintenance)* called attention to the fact that whereas formerly, every effort was made to use equipment for purposes of economy, today the operating department is making greater demands on the track and the trend is to give up tracks less and less to maintenance forces for the purpose of overhauling them. Yet, the roadway forces must maintain the tracks to enable the transportation department to use them, with less forces than normal and must therefore eliminate every possible cause for delay to these forces in order to secure the maximum output from them. This necessitates a new approach to the problem of maintenance by both departments. He mentioned one road of relatively dense traffic that is today "killing" short sections of one main track during working hours to permit tie renewals, surfacing, and similar routine patch work as well as rail

By Personal Contact, Supervisors Must Know Their Machines and Their Operators

laying and repairs to bridges to be done without interference by traffic. This road has found, he said, that there is less overall interference with train movements when the maintenance of way work is concentrated, even though trains are diverted over a short section of single track, than occurs when this work is done at numerous points under traffic, with their slow orders, while the work of the track forces is greatly advanced. In view of the present density and importance of traffic and the speed of trains, he urged maintenance officers to develop new expedients to eke out the labor that is available and not only eliminate delays to machines while in use, but extend the hours such equipment is worked.

President Banion reported that transportation officers on his road recognize the importance of these requirements and are giving track maintenance forces better co-operation than ever before, for these transportation officers realize that more work can be done on a dead track than can be done under traffic. Mr. Banion then emphasized the advantages of spot tampers, and the fact that they can be used for other purposes than tamping ties. He also stressed the importance of good field maintenance in keeping power machines in continuous operation.

Saying that, so far, power tools for section gangs on his road have been limited to spot tampers and mowers, F. G. Campbell (E.J.&E.) inquired regarding the extent to which the use of machines by section forces can be expanded. Mr. Gilkey replied that his section gangs are now using bolt tighteners, to tighten their bolts out-of-face, the practice being to pass the machines along from gang to gang. An operator remains with the machine as it moves along the road, but each section furnishes such additional help as may be needed, and both the machine and the operator are under the foreman's charge while on his section. Mr. Gilkey reported that he also has several small weed burners, which reduce the consumption of oil, but kill the weeds as effectively as the larger machines. He likewise has a number of portable hand-operated burners which are assigned to individual sections, and several small mowers which are used on station grounds, in yards and at places where weeds interfere with trainmen.

Mr. Gilkey said that three shipyards in his immediate territory have taken most of his equipment operators or they have been inducted into the army, so that the training of other men to run the machines has assumed major importance. He emphasized the further need to educate men who can act as under-studies to the operators and take their places when they are absent because of sickness or other causes.

J. B. Kelly (M.St.P.&S.S.M.) stated that it had been his custom to pick a likely man out of the gang to train as an operator, but that recently five of his men quit rather than operate equipment.

In reply to questions, Mr. Gilkey described the organization that he thought should be employed to keep the machines in operation. He emphasized the value of frequent inspection by the repairman, the need of a well-equipped shop in which each unit can be overhauled every year and the necessity for a high order of field maintenance. It was his contention that both field and shop repairs, together with the entire equipment maintenance personnel should be under the supervision of the maintenance of way department. In support of this position, F. E. Schaumburg (C.&N.W.) stated that the repair of work equipment on this road had recently been taken from the mechanical department and placed under the engineering department, with very satisfactory results. Under their new organization, a repairman is stationed on each operating division, and a mechanic and helper are assigned specifically to a rail gang, a large surfacing gang or any gang where delay incident to a machine failure might be costly.

Housing of Track Laborers

Report of Committee

L. E. Smith
Chairman

UNDER normal conditions it is important to provide attractive and comfortable housing for track laborers. Under present conditions it is not only desirable but absolutely essential to do so if the right kind of men are to be retained in competition with the war industries which are in position to offer higher pay and other attractions. The headquarters of railroad forces are, of necessity, often remote from towns, and recreation facilities such as movies or other forms of entertainment cannot be made available so that these handicaps must be overcome so far as possible by the provision of clean, comfortable quarters, with ample provision for bathing, the serving of good meals, and such after-hours entertainment as the radio, reading, card playing, etc., as is reasonably possible. The best labor stays where living is comfortable and attractive, but will move on quickly where quarters are unattractive and not kept clean and free of vermin.

Types of Housing

Two general types of housing are provided by the railroads: (a) Permanent housing, more frequently for regular section gangs but sometimes also for extra gangs which are employed in one locality for long periods, and (b) housing in cars which are moved from place to place as the work progresses. Tents or other portable dwellings are also used in some instances but this practice is quite uncommon. More recently, because of the shortage of cars, camp houses of the put-together, take-down type are coming into use in some places. These houses are bolted together in such a way that they can be taken apart, moved, and then reassembled.

Whatever the type of structure, it must be so designed that it can be kept clean, well ventilated in hot weather and evenly heated in cold weather. All windows and doors must be kept well screened and space must be provided not merely for bunks but also for evening recreation. Toilet facilities must be sanitary and showers or other bathing facilities must be provided. Kitchen and dining facilities must likewise be attractive and clean. Proper refrigeration is essential. Illumination should preferably be by electric light, generated by a portable power unit when working remote from available power lines.

Radios should be provided or the men encouraged to provide their own sets. Where electric refrigeration is not feasible because of lack of power, an adequate supply of ice must be provided in hot weather.

Years ago, almost any kind of accommodation was considered sufficient for the class of labor then available and although those close to the work often realized that better accommodations would have paid well, it was frequently impossible to secure authority to provide them. Through the years, the class of labor employed has changed from those with little regard for cleanliness and none whatever for germs, to the present day where high school boys and others with much higher living standards are being employed.

The Character of Camp Cars Provided Has a Large Influence on Holding Men

Questionnaire Sent

In order to obtain first-hand information as to present-day practices, your committee sent a questionnaire to its members and their replies are condensed herein.

The questionnaire was as follows:

No. 1—In what way are track laborers housed on your railroad?
- (a) Section laborers
- (b) Extra gang laborers

No. 2—Is rent charged?

No. 3—Are modern facilities provided, such as running water, electric lights, etc?

No. 4—In providing housing, are new buildings constructed, old buildings remodeled or old buildings used?

No. 5—Has the war effected the housing in any way? If so, what has been done to overcome the situation?

No. 6—Do you get any better class of laborers by housing them and do they stay on the job longer?

Significant statements selected from replies to the questionnaire are as follows:

"The Southern Pacific has been forced into furnishing houses for its track laborers due to the fact that at most of its section headquarters there are no housing facilities, headquarters frequently being located outside of and away from any town. I am of the opinion that we get a better class of laborers by furnishing living quarters, as this amounts to an increase in wages." T. L. Williamson, roadmaster, S. P., Winnemucca, Nev.

"The war has affected our housing of laborers to some extent, in that because of the scarcity of building materials, very few buildings have been constructed to house laborers. We have also curtailed the converting of revenue equipment into non-revenue equipment (camp cars) because of the peak business which is being handled and the necessity for using all revenue cars for such business. I feel that we get a better class of

laborers, especially section laborers, where housing facilities are provided by the railway for the laborers' families. This is true especially where outside housing facilities are scarce." P. L. Koehler, division engineer, C. & O., Ashland, Ky.

"From conversations with maintenance men in many localities, I find that the war has affected their housing problems materially, making it necessary for them to build labor camps, either permanent buildings or camp cars, to take care of the floating type of labor, which is the only type now available in many industrial sections. It appears that, after having abandoned labor camps generally for the last eight or ten years, many roads, particularly east of Chicago, have found it necessary to re-establish camps in order to take care of their men and hold them on the job. It is not so much a case of getting a better class of labor by providing good housing facilities as it is to get and hold any class of labor in these days of such active competition for labor." Neal D. Howard, managing editor, *Railways Engineering and Maintenance,* Chicago.

"Our section laborers are housed in two-room houses built near section headquarters. We make no attempt to house extra gang laborers but do permit them to occupy vacant section houses if they are not needed by local forces. Track laborers should be placed in comfortable houses, containing modern conveniences, especially at outlying points. In the towns and cities, our laborers usually have their own homes." G. S. King, track supervisor, Southern, Chester, S. C.

"The war has affected the housing of our section and extra gang laborers, especially for section laborers in the vicinities of vital areas. The housing situation for extra gang laborers is affected by the increased demand for cars of all kinds. Nearly all of our camp cars are cars that were formerly in revenue service and to meet the demand for revenue cars resulting from war demands, a considerable number have been reconverted for revenue use. Consequently, living accommodations in our camp cars are less comfortable today than during ordinary conditions. An expected serious shortage in camp facilities has been offset somewhat by shortages in labor. A serious problem in the replacement of existing cars as they become unfit for further service may result." A. E. Botts, assistant engineer maintenance of way, C. & O., Richmond, Va.

"During normal times, I do not believe that it is necessary to house section labor, although it is, of course, necessary to provide good camp car equipment for extra gang laborers that are moved from one point to another. As a rule, I believe that section laborers prefer to find their own homes, and when they do, they will remain on the job longer than if housed in a company building in which they have no particular interest. During war times, because of the difficulty in securing section labor, the picture may be changed, and it may become necessary to provide special housing facilities to take care of the labor that must be brought in to take the place of labor that cannot be obtained locally." Armstrong Chinn, general manager, Alton, Chicago.

"Since the war, we have faced somewhat of a problem in some of our larger cities and terminals, due to so many of our regular men going into military service or being attracted to war industries at higher rates of pay. The result has been that we have had to pick up laborers from the scant floating supply. Many of these men are 'floaters,' the next thing to tramps, without homes or possessions. In a number of instances we have been obliged to build temporary barracks for them. These buildings accommodate 50 to 60 men and provide eating and sleeping facilities." R. Marshall, district roadmaster, Great Northern, Minneapolis, Minn.

Kitchen and Dining Facilities Must Likewise Be Attractive and Clean

"I believe that track laborers should be considered as a better investment for housing, and would like to see bunk houses built which would house separate families, for family men will stay much longer when furnished quarters for their families. Such buildings can be of any suitable material and built as one long structure, partitioned off into four or five-room units as necessary. On the Denver & Salt Lake, with so many transient laborers, it is difficult to find anyone who will stay long enough to enable us to train and break them in as track patrolmen and relief foremen." G. B. Aydelotte, roadmaster, Denver & Salt Lake, Sulphur Springs, Colo.

"We cannot get additional board-

Where Houses Must Be Provided for Section Forces, They Should Be Sound, Weathertight and Attractive

ing car outfits or replacements for existing outfits. This is due to a shortage of cars suitable for conversion. Some thought has been given to installing labor camps at various points where our labor situation is critical." C. H. Higgins, division engineer, Boston & Maine, Concord, N. H.

"In the past many new buildings were constructed, but at present, and in fact in recent years, no additional buildings have been provided and at the few places where we do not have houses, our laborers have to buy or rent places of their own. They consider their living quarters, when furnished without charge, as part of their wages, and know that they would have to earn considerably higher wages on other work if they were paying rent. The result is that they settle down and stay on the section." A. J. Dillard, roadmaster, Atchison, Topeka & Santa Fe, Dodge City, Kan.

Committee—L. E. Smith (chairman), rdm., M. P., St. Louis, Mo.; T. L. Williamson (vice-chairman), rdm., S. P., Winnemucca, Nev.; G. B. Aydelotte, rdm., D. & S. L., Sulphur Springs, Colo.; A. E. Botts, asst. engr., m. w., C. & O., Richmond, Va.; Armstrong Chinn, ch. engr., Alton, Chicago; A. J. Dillard, rdm., A. T. & S. F., Dodge City, Kan.; C. H. Higgins, div. engr., B. & M., Concord, N. H.; N. D. Howard, managing editor, *Railway Engineering and Maintenance*, Chicago; G. S. King, trk. supvr., Sou., Chester, S. C.; P. L. Koehler, div. engr., C. & O., Ashland, Ky.; R. Marshall, dist. rdm., G. N., Superior, Wis.; W. H. McNairy, trk. supvr., Sou., Batesbury, S. C.; R. E. Vandivort, rdm., P. & L. E., Pittsburgh, Pa.; and A. H. Whisler, asst. engr., Penna., Philadelphia, Pa.

Discussion

C. Halverson (G. N.) cited one instance in which it became necessary to put on a large gang at a point where there were no housing facilities, and it was possible to obtain the required number of men at a town some distance away, although they would not live in camp cars. To overcome this difficulty, trucks were assembled and used to haul the men to and from their work for distances up to 50 miles on either side of the town.

President Banion cited a similar experience at a point where there was no housing for the men in a floating gang, but where he also found that he could secure the necessary men in a nearby town if he would transport them by highway. As in Mr. Halverson's case, these were men with families, who would not consent to live in camp cars.

N. D. Howard *(Railway Engineering and Maintenance)* suggested that the practice of trucking laborers to and from work is having some effect on housing practices. Also, since cars for camp purposes are now difficult to obtain, and in view of the objections to permanent camps for labor that must be moved from point to point, he inquired to what extent knock-down houses are being used for the housing of labor. He reported having seen such a camp, including bunk houses, a kitchen and a dining building on the Great Northern, and suggested that this form of construction be given consideration. President Banion replied that he knew of several roads that are now considering the use of portable houses of this type, including those for showers, toilets and recreation facilities.

Extending the Life of Switches, Frogs and Crossings

Report of Committee

A. G. Reese
Chairman

THE responsibility for securing the maximum service life from switches, frogs and crossings rests upon the maintenance of way department from the time that the type and design are approved by the chief engineer and the purchase order is forwarded to the manufacturer. Frequent and close inspection during construction insures strict adherence to plans and specifications. This in turn assures maximum service life, provided equal care is exercised in installation and maintenance of these facilities.

Crossings

The speed and density of traffic govern the type of crossing to be installed, manganese construction being preferred for locations where speeds are high and the tonnage heavy. Similarly, open-hearth construction is preferable for locations where the speeds are slower and the tonnage lighter. In determining the type of construction to be installed, consideration should be given to the permanence of the line involved and open-hearth construction specified if there is any imminent possibility of realinement or abandonment. Possibilities for the re-use of a crossing in another location in case it is rendered useless by realinement or line abandonment should always be canvassed as this can and often should be a determining factor in arriving at a decision as to the type of crossing to be specified.

The present weight of rail and prospective future relays with the section set up as standard for the particular line, govern the weight of rail for the crossing and installations should anticipate this future relay by construction of that weight, even though it may be necessary to step down to meet the present rail section until such time as the relay is actually realized. By this process, maximum service life is more fully guaranteed since replacement with a crossing of the heavier weight of the new standard rail section is not necessary at the time of the relay.

In open-hearth construction, the section of rail involved should always receive special consideration and the crossing should be built of a section standard on that road, as the supply of rail in many weights is disappearing rapidly and in some cases has been exhausted since the rolling of that particular section was discontinued. To continue a crossing in one of these

weights requires special rolling of rail, with the consequent penalties for special rolls and limited quantities.

Frogs and Switches

The same factors govern the type of frogs to be specified, but with the added consideration of the angle of turnout and location of the switch.

In main-line turnouts where the speed to be maintained through the switch is fairly high, such as at the ends of double track or through high-speed crossovers, rigid frogs of manganese and manganese-insert construction can certainly be justified. Through siding turnouts where speeds are restricted and the traffic on the main line side of the turnout is many times heavier than on the siding side, spring-rail frogs of open-hearth construction should always be used.

On heavy switching leads, rigid frogs of manganese and manganese-insert construction have been found to give longer service than open-hearth frogs, and as a result, this type is generally specified in either the self-guarded type or the standard rigid frog with guard rails. In yard switches, other than those in lead or ladder tracks, the use of manganese construction cannot always be justified economically since the first cost of an open-hearth rigid frog is much less and satisfactory service life can be realized by welding whenever necessary.

The construction of switch points and stock rails is, of course, dictated by the service they are expected to give. Double stocking, if properly done, will effect some saving in switch point wear and the use of milled points which are finished to fit against a prepared stock rail have proved to give maximum service with minimum expenditure for maintenance and replacement. Switch point protectors, of which there are many different kinds on the market, have proved their efficiency in preventing excessive wear on switch points, but their extended use should be confined to yard tracks where switching movements are frequent and slow. An inner guard rail switch-point protector has been used on main tracks, but its use is not recommended on high-speed lines on account of the difficulty in maintaining alinement where it is used.

Installation

Outside of the proper design and construction of switches, frogs and crossings, no factor contributes more toward their maximum service life than the manner of their installation. It is axiomatic that installation according to standard plans has provided the necessary attention to gage, line and clearances, but the proper placing of guard rails, with particular attention to gage, in order to afford the necessary protection to frog points, cannot be over-emphasized.

If it were possible to dictate the subsoil conditions upon which a switch, frog or crossing were to be placed, the matter of maintenance could be largely solved at the time of installation. Since this is not possible,

Arc Welding Has Greatly Extended the Life of Manganese Frogs and Crossings

measures to improve the subgrade conditions through drains of various sorts, stabilizing by means of grouting or placing concrete slabs, etc., have been proved to extend the life of crossings as well as switches greatly. In case where two double track lines are involved, a center catch basin, together with drains carrying surface waters to a sump or depression, will usually insure adequate drainage and a stable subgrade. Where conditions permit, excavation of surface ditches to carry off flood waters and insure rapid run-off will suffice, but in too many instances adjacent tracks prevent this method of control. In instances of this kind where pervious material is located not too deep below the surface of the track, a cheap and effective way to secure drainage is to excavate a sump down to the water-bearing gravel and backfill with washed gravel. This, with either French drains or tile to carry the water to the sump, will prove a very acceptable method of providing drainage and prevent the puddling and churning condition which interferes with the proper tamping of a switch or crossing, resulting in the working action which causes cracks in the manganese and broken bolts and fillers in open-hearth construction.

Treated hardwood ties, properly spaced and tamped on a cushion of hard and sharp ballast, furnish a cushion for switches, frogs and crossings which greatly extends their service life. Ballast should be sufficiently coarse to afford satisfactory drainage, yet fine enough to permit tamping firmly. Various types of slag and rock, processed from ¼ in. to 1¼ in., and about 12 in. in depth below the ties, will ordinarily furnish a satisfactory cushion, which will insure good surface and line with a minimum of maintenance.

At the time of installation, switches, frogs and crossings should be protected against movement of the rail in every direction to prevent warping and excess wear on these installations. A liberal use of anti-creepers and rail clips have proved that the satisfactory anchoring of the rail can be accomplished to prevent movement.

Inspection

When switches, frogs and crossings are properly installed, the securing of maximum service life becomes a matter of unceasing vigilance in inspection and repair. Daily inspection should be made of all installations where speeds are high and tonnage heavy. These inspections should never be allowed to become cursory and routine, and all defects that develop should be corrected at once. Bolts, switch rods, braces, etc., should be kept tight and ties tamped to a

Daily Inspection Should Be Made of All Switch Installations in High-Speed, Heavy-Duty Tracks

solid bearing at all times. Line, gage and surface must not be neglected.

In locations where sand is used freely by switching and road locomotives, considerable wear on crossings, frogs and switches can be eliminated by keeping the sand swept out of the frogs and movable points. The use of rail and flange lubricators has also proved valuable in reducing wear, but this practice must be considered carefully as the application of lubricant where sand is used results in increased wear on both the track installation and equipment.

In certain locations where the wear on frogs and switches is much greater on one side than on the other, consideration should be given to changing the frogs and switch points from one side to the other before wear becomes excessive. In other words, a rigid frog may be changed from one end of a siding to the other. This will result in extending the period between replacements and welding repairs.

Different means of making the daily inspection are in force on different railroads, some requiring the foreman to make the inspection, others using a track walker and still others employing the supervisor or patrol system. Eliminating any comment regarding the system to be used, any defect or irregularity discovered should be corrected at once and a report forwarded to the roadmaster, citing the condition and the measures that have been taken to correct it. No defect, however small, should be neglected, in the interest of either safety or economy, as these conditions do not improve under neglect.

On lines of lighter traffic, while daily inspection may not be necessary or possible, it is just as important that the inspection be made as often and as carefully as conditions will permit. An installation in a secondary line represents an expenditure as great as an installation of equal weight in a heavy-duty main line; therefore, it should be protected as well.

Welding and Grinding

The service life of switches, frogs and crossings can be and has been extended from 50 per cent to 100 per cent by welding. Arc welding in the repair of manganese frogs and crossings, if done at the time needed, has resulted in the almost indefinite extension of their life. Experience has shown that while a manganese frog or crossing may have to be replaced on account of cracks in the casting, the running surface can be maintained for continued service by welding, and replacement is necessitated by defects in material, obsolescence, or other conditions, rather than from mechanical wear. The welding of manganese units should not be deferred until a great deal of wear has occurred for it is believed that more frequent small welds are a great deal cheaper than one large welding job. However, the metal is affected to some extent by the pre-heating and for this reason new manganese should not be built up until the wear reaches a point at which "pounding" is ready to develop.

The repair and maintenance of open-hearth crossings, frogs and switches by oxy-acetylene welding, if done before the wear becomes excessive, has prolonged the life of these parts almost indefinitely. A well organized welding department under the supervision of a competent and aggressive inspector, has proved to be a most important factor in securing the maximum life of these crossings, frogs and switches. Where possible, repairs to these units should be made in the track to avoid the expense of replacement and transportation to a central welding shop. However, train speed and density of traffic enter the picture and, on important lines, it is often advisable to replace the crossing or frog and to send the released unit to the welding shop for repairs.

A comparatively new development in the maintenance of crossings, frogs and switches is the use of the grinder. Dressing off the flow on new manganese units prevents spalling or chipping. Also, the grinding of stock rails, open-hearth frogs and switch points insures satisfactory contact and fit, preventing the chipping off of material, which has been the cause of altogether too many replacements in the past. All welding, both manganese and open hearth, should be finished by grinding to insure a satisfactory surface.

If the factors of type and construction receive the necessary consideration, and installation and maintenance receive the required attention, a greatly prolonged service life from our crossings, frogs and switches will result, an objective which is so essential in this period of acute shortages of critical materials and labor.

A. G. Reese (chairman), dist. engr., C. B. & Q., Galesburg, Ill.; R. B. Rust, Jr. (vice-chairman), trk. supvr., Sou., Chattanooga, Tenn.; R. W. Bonney, gen. rdm., Seaboard, Jacksonville, Fla.; F. G. Campbell, asst. ch. engr., E. J. & E., Joliet, Ill.; M. D. Carothers, ch. engr., Alton, Chicago; C. O. Enlow, rdm., P. & S. F., Slaton, Tex.; J. H. Gibbs, rdm., M. P., Wichita, Kan.; A. B. Hillman, engr. m. w., C. & W. I.—Belt Ry. of Chicago, Chicago; H. E. Kirby, asst. engr., C. & O., Richmond, Va.; G. P. Palmer, engr. m. & c., B. & O. C. T., Chicago; E. Schoech, rdm., C. M. St. P. & P., Marion, Iowa; and A. W. Schroeder, rdm., C. B. & Q., Central City, Iowa.

Oxy - Acetylene Welding Has Been a Major Factor in Extending the Life of Open - Hearth Frogs, Switches and Crossings

Discussion

E. E. Crowley (D. & H.) emphasized the desirability of applying welds before the frog or crossing becomes worn enough to require a large weld. It had been his experience, he said, that after three or four large welds have been applied at the same point, the parent metal at this point in the frog or crossing, begins to deteriorate and fails within a short time.

In response to an inquiry by F. G. Campbell (E. J. & E.), about the desirability of different types of switch-point guards, Chairman Reese replied that it was the belief of the committee that either the inside guard rail or the outside flange guard will give best results for low-speed tracks, but that neither should be used on high-speed tracks. This was followed by a long discussion on the merits of the various designs of switch-point guards. During this discussion, Mr. Reese cited an instance on one road where an inside guard rail increased the life of switch points three times.

W. H. Sparks (C. & O.) described the practice on his road of inspecting switches, under which the trackwalker makes a daily inspection; the foreman a weekly inspection, which he reports to the supervisor; and the supervisor a 60-day inspection, which he reports to the division engineer. He said that in yards, excellent results have been obtained in reduced wear on switch points by welding a plug on the gage side of the rail a short distance ahead of the point, particularly where proprietary guards wear out in a short time.

Getting the Most From Crossties

Report of Committee

C. Halverson
Chairman

IN December, 1940, the steam and electric railroads (including rapid transit, surface, and suburban) in the United States operated approximately 429,244 miles of tracks supported by 1,288,000,000 crossties, of which about 992,000,000, or 77 per cent, had been given preservative treatment. During the last 51 years, 1,520,000,000 crossties were treated, of which 65 per cent are still in service. The savings in this period by reason of treatment aggregated 2,390,000,000 crossties, with a value of $2,440,000,000, averaging nearly $48,000,000 annually at the rate of saving $124 per mile of track.

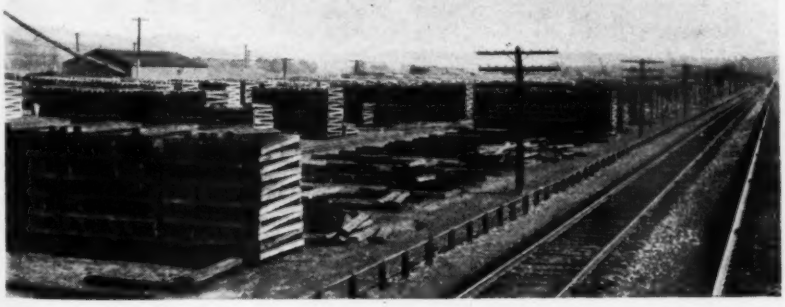
To produce these crossties, if they all came from saw timber, would take the cut on 543,000 acres of saw-timber land, or if they all came from tie timber they would take the production from 3,630,000 acres of tie-timber land. If a program of inserting an annual average of 43,000,000 treated crossties is followed until 1963, all tracks will then be provided entirely with treated crossties.

Fifteen years ago it was thought that 60,000,000 treated crossties would be needed annually, but in view of the more thorough manufacture and inspection, seasoning, treatment, adzing, and boring of crossties, larger tie plates, heavier rail, improved ballast and roadway drainage, a longer life is being secured than was expected.

The present crisis has changed the picture somewhat with respect to the life of the treated crosstie. The present increased traffic (it has more than doubled by reason of the war traffic) can be expected to take its toll of the crossties by reason of the increased wear to which they are being subjected. The construction of tracks to serve new defense plants, cantonments and supply depots, and for other governmental uses has also required a large number of treated ties, which must be taken from the available supply.

This is the situation that confronts the railroads today. It creates a problem that maintenance men must make a concerted effort to meet. Obviously the shortage of labor will reduce the amount of out-of-face surfacing, in the performance of which it has been the general practice to renew all of the ties that were marked for renewals during the current year, in addition to those that would be renewed in the succeeding year or two, to avoid disturbing the track and to eliminate the expense of spot renewals later. Regardless of the economies effected, this practice will undoubtedly have to be discontinued for the duration of the present emergency.

The demand for timber greatly exceeds that of any previous experience, because of increased uses of timber growing out of the present crisis. Getting the most from crossties is a problem, therefore, that confronts all maintenance officers today because of the widespread shortages and priorities. Our task as maintenance officers is to get the maximum service possible from the crossties that we have in order that we may maintain efficiently this vast and important transportation system of ours. We have reason to feel proud of the records established by our railroads in the transportation of the men, food, materials and ammunition that are vitally needed to promote the war effort.



Only by Proper Seasoning and Preservative Treatment Can the Maximum Life Be Secured from Ties

Species and Seasoning

Data furnished by the United States Forestry Service show the following percentages of the different species of woods used for ties in 1941:

Oak	47.54	pine	2.78
Southern pine	19.20	Tamarack	2.69
Douglas fir	9.22	Maple	2.06
Gum	7.48	Birch	1.27
Ponderosa pine	3.09	Elm	1.08
Lodgepole		Birch	0.96
		Hemlock	0.44
		All others	2.19

The seasoning period varies from 6 to 12 months. Fir ties must be treated before they become too dry as this wood hardens on the outside and consequently, when treated, retards the penetration of the preserva-

tive. Pine and oak can be seasoned a year without interfering with the treating results. Birch checks more than maple during seasoning and it is not advisable to season it too long during the summer. The application of anti-checking irons remains the best method for reducing splitting losses in ties during the period of air seasoning, the irons being driven into the ends of the ties shortly after they are placed in the seasoning yard. Irons should be applied to all ties that show signs of severe checking.

All ties, whether for main-line or side-track use, should be treated with a preservative and pre-bored. All tie requisitions should stipulate the boring to fit the specific tie plate used, thereby preventing splitting or checking of the ties when they are spiked properly. A large percentage of the ties are treated today with a creosote-petroleum mixture.

Loading and Unloading

Ties should be loaded in such a way as to prevent shifting enroute. If loaded in open-top cars with a crane, care should be exercised to avoid dropping them from too great a height in order to avoid undue strain on the ties on the bottom of the load.

Most crossties are unloaded from work trains, and in the hurry to clear trains and get the work done, some ties are damaged unnecessarily. If a tie is checked badly it will probably split worse if handled roughly. The train should be moved at a slow rate of speed and the ties shoved out of the car door, dropping one end on the floor of the car to allow the ties to fall from the car in the direction the train is moving, which allows the tie to drop from the car with the minimum fall and usually come to rest on the subgrade clear of trains. If the ties are to be inserted in the track soon after the unloading they should be spotted opposite the ties to be renewed. On the other hand, if they are to be stored for the next season's renewals at stations or on line, they should be piled as compactly as possible and covered with earth wherever they are exposed to falling sparks. Treated ties that are not to be placed in track immediately should be piled and covered with dirt to prevent the leaching out of the preservative.

Ties should be piled on ground that is free from debris and vegetation and adequate space should be provided between the piles to permit fire control. Decaying wood should definitely be removed. The care and selection of places on which to pile the ties is important. Ties should be piled on high ground that drains easily, for water has a detrimental effect on the preservative, particularly when the ties are treated with chromated zinc chloride or zinc meta arsenite.

Inspecting Ties

Crossties comprise the largest item of expenditure in the maintenance of track and no feature of roadway maintenance requires more practical knowledge than that of inspecting crossties for renewals. The inspection of crossties in advance of renewals is most essential to getting the maximum service from the ties. Such inspections should be made jointly by the supervisor of track and the section foremen.

The tie inventory, if checked carefully with the percentage of renewals made yearly, will reveal the average life of the ties on the various lines, and will provide a check on the correctness of the tie inspection, density of traffic and other factors being considered.

The most important objective in the inspection of crossties is to determine what ties are to be renewed or what ties, if left in service for another year, will, by their further deterioration or wear, place additional strain on the adjacent ties to the extent that their service life will be shortened materially.

To determine the condition of a tie to be removed, a test should be made under the rail where it carries the load. A tie may have the outward appearance of being sound, while a careful inspection may disclose that the bottom is deteriorated and that the tie is carrying a negligible part of the load, placing additional strain on adjoining ties.

Ties selected for renewal should be marked by the section foreman at the time of the inspection, so they can be identified when the renewals are in progress. Then in the spring before a tie is removed it can be tested again to determine whether it can be left in track for another year.

Tie replacements represent a stupendous figure in the cost of maintenance and because of the increased demand for timber products, less good timber is now available for ties. The roadmaster's problem is definitely, therefore, to get along with fewer ties. After the ties have been delivered, it is the roadmaster's responsibility to see that those needed for replacement are placed where they will give the best possible service. Scattering the renewals throughout the panel, with no two adjacent except at the joint, provides a better balanced track panel. Uniform distribution of tie strength provides better riding track and reduces maintenance costs.

In renewing ties, the joints should be given preference. Joint ties represent nearly 20 per cent of the ties in track and their importance in relation to the intermediate ties should not be underestimated. Poor joint ties will lead to damage to the rail ends and the entire joint assembly.

Tamping the New Ties

Care should be exercised in preparing the bed for the new ties. Ties are now of nearly uniform size and consequently there need be little change in the tie bed. The less the old tie bed is disturbed, the less tamping the new tie will require to provide a good solid bearing. The tie should be tamped evenly, keeping in mind the importance of avoiding damage to the wood fibre when using mechanically-operated tamping tools.

The ballast should be replaced, keeping in mind the importance of placing the material firmly and in sufficient quantity around the new tie between the rails. If this is not done, there will be voids along the sides of the tie which will invite the penetration of moisture into tie bed, which, in turn, will result in the tie losing its bearing and a subsequent decrease in its service life by reason of early decay.

Ties should be of uniform size and strength and spaced uniformly to transmit the greater load to the roadbed. Any irregularity in the spacing and in the strength of the ties places additional stress on the individual tie, with increased mechanical damage.

How Traffic Affects Ties

The construction of defense plants and training camps incidental to the war effort have brought increased traffic to many secondary main and branch lines that were not in condition to handle this type of traffic. On tracks of this kind, where ties are not protected with tie plates and the ties are badly rail cut, much can be accomplished by the use of adzing machines to provide a smooth level bearing surface for the rail and reduce wear. When ties are adzed, the cut surfaces should be painted with a preservative and all spike holes should be fully plugged.

Tie Plates and Anchors

No one track fastening has been responsible for a greater reduction in wear on crossties than the tie plate. The large tie plate covers the entire face of the tie, and greatly reduces the amount of damage to the wood fibres by crushing. It also permits the transmission of the load to a greater area of the tie. The use of

larger tie plates has reduced the amount of gaging which was necessary where smaller plates were used, and this has permitted ties to remain in track that otherwise would have been removed on account of being spiked killed.

The new standard tie plate is punched with eight holes, permitting uniformity in spiking to provide greater gage security and in distributing the spiking over the area of the tie plate to minimize the weakening of the tie.

With Insufficient Ties Available on Most Roads, The Greatest Care Must Be Exercised in Selecting Those To Be Renewed

A sufficient number of rail anchors, well distributed throughout the track panel, are essential to well-maintained track. Where the rail is not adequately anchored, ties will shift around and become slewed, causing gage kinks and leaving voids that permit the penetration of moisture. Ties that are shifted by creeping rail also lose their bearing, resulting in a greater load being transmitted to the adjoining ties, with subsequent increase in wear of the crossties.

Where joint ties are spiked to the angle bars and sufficient anchorage is not provided to arrest creeping of the rail, such ties are damaged by splitting. Some of the newer designs of rail anchors are designed to fit against the tie plate, thereby preventing damage to the crossties by reason of the rail anchors pressing against the wood fibre.

Renewal Through Crossings

The maintenance of track through acute-angle grade crossings has long given maintenance officers much concern, for moisture seeps through the planks and causes irregularities in the track surface, joints become low with resultant damage to the entire joint assembly and the life of the tie is shortened because no drainage is afforded. Much can be done to correct this situation—install a fresh bed of gravel, renew all ties through the crossing, provide substantial tie plates, butt weld rails to eliminate joints through the crossing and also butt weld the flange rails; then place a hard-surface material between the rails, using planks for headers on the outside of the rail to facilitate changing of rails. This hard surface material provides a covering for the ties that keeps out the moisture, adding many years to their service; it also provides a smooth riding crossing with minimum maintenance.

When ties are adzed during the process of relaying rail, the adzing should be limited to the old tie plate seats, and after adzing, the old spike holes should be fully plugged and a generous coating of preservative applied to the adzed surfaces. All loose ties should be brought to surface and the track spikes should be set vertically and driven squarely.

Drainage Adds to Life

Water is the most persistent enemy of roadway maintenance. Quick-draining ballast, along with a good system of drainage, is the most important preservative of crossties. A deep bed of good ballast is essential to well-maintained track. It must be of correct size and must be clean and free from dirt or other debris to drain properly. The cleaner the ballast, the better will be the drainage. The crushing and screening of pit-run gravel has provided gravel of the desired types. Sound, clean material, of uniform size, will compact and leave few voids in which dirt will collect and block drainage. It is essential to have not only good side-ditch drainage but also cross drainage as well, to maintain the ballast and provide a solid dry bed for the ties.

On some roads, the use of off-track equipment has done much to improve the side-ditch drainage. Cuts have been widened and the material excavated has been used to strengthen the subgrade on fills. A method that has been tried out and found to be highly successful involves the use of a tractor and bulldozer on the top of the cut, removing the material and shoving it down into the ditch where it is picked up with a modern Jordan spreader and wasted on the fills. This method provides a ditch to be constructed at the correct distance from the track to allow the surface water to drain into it quickly and flow off.

Treated ties absorb moisture, for this reason it is highly important that surface water be removed as rapidly as possible, for this prevents ties from becoming soft.

The importance of dressing track should not be overlooked. Tie cribs should be well filled at the center and sloped gradually to the ends of the ties, which will allow surface water to drain away quickly to the side ditches.

Under present circumstances, maintenance officers have been left pretty much to their own resources during the last year or so, and have had to get along with the materials available for repairs instead of having new materials available for replacements. That they have been equal to the occasion is evident by the unparalleled volume of transportation being delivered by the nation's railroads today.

Such tie plates as are released in the process of relaying rail or applying new tie plates should be allocated to the secondary and lighter-traffic lines where tie plates are not now provided, giving preference to curves. The added expense for repunching such plates to fit the rail section is well warranted, as the plates add much strength to the track structure, eliminate frequent gaging and minimize mechanical damage.

Preventing Damage to Ties

At points where locomotive fires are cleaned and modern cinder pits are not available, ties can be covered with scrap metal decking salvaged from bridges. This covering will prevent damage to ties.

Treated ties should always be handled with tie tongs. The use of picks should not be permitted. When spacing ties, tie spacers should be used; the use of spike mauls or sledges should not be permitted. All ties which are marked or otherwise dam-

aged by derailments should be trimmed and a generous amount of preservative applied.

It is a recommendation of the committee that all main-line ties treated with a preservative be pre-bored and pre-adzed.

Committee—C. Halverson (chairman), rdm., G. N., Grand Forks, N. D.; M. D. Packham (vice-chairman), drm., A. T. & S. F., Emporia, Kan.; R. H. Campbell, supvr., Sou., Oxford, N. C.; A. B. Chaney, dist. engr., M. P., Little Rock, Ark.; M. L. Denney, trk. supvr., Indpls. Union Ry., Indianapolis, Ind.; W. T. Donoho, dist. engr., G. C. & S. F., Galveston, Tex.; J. H. Kieth, supvr., Western Ry. of Ala., Montgomery, Ala.; G. B. McClellan, gen. rdm., T. & P., Alexandria, La.; F. J. Meyer, ch. engr., N. Y. O. & W., Middleton, N. Y.; P. F. Muller, rdm., C. & W. I., Chicago; W. H. Sparks, gen. insp. trk., C. & O., Russell, Ky.; R. D. Thomas, rdm., Seaboard, Raleigh, N. C.; and J. S. Vreeland, associate editor, *Railway Engineering and Maintenance*, Chicago.

Free-Draining Ballast Is Essential to Prevent Decay and Secure Long Tie Life

Discussion

F. G. Campbell (E. J. & E.) questioned that part of the report discussing the seasoning of ties before treatment which said that pine and oak ties can be seasoned a year. This was correct for oak ties, he said, but pine ties, and particularly Southern pine, normally should not season more than six months, for decay might set in. G. E. Boyd *(Railway Engineering and Maintenance)* pointed out that decay is more apt to set in if the pine ties are seasoned in a locality where the humidity is high. R. H. Gilkey (C. of Ga.) replied that proper seasoning before treatment is very important with all ties and particularly with Southern pine ties. He recalled that whereas such ties used to be allowed to season in the woods, they are now shipped to the treating plants, where they can be seasoned under more favorable conditions and can then be treated as soon as they have been seasoned properly.

A. B. Chaney (Mo. Pac.) referred to that part of the report dealing with the unloading of ties from work trains and stated that he did not think work trains were used much for this purpose on lines with average tie renewals on most railroads. He also suggested that to save labor, treated ties stored in piles on the right-of-way need not be covered with earth, except where protection from locomotive sparks is needed. Referring to the storage of ties, he mentioned that some roads arrange to store a 30 to 60 days supply of treated ties at the treating plant and ship these currently as needed, in which case they are unloaded where they are to be used, eliminating the necessity of storage and rehandling.

Mr. Chaney then brought up the subject of tie inspection and suggested that the check of ties to be renewed the following year should not be left to the judgment of the section foreman alone. Mr. Campbell concluded that the section foreman was better qualified to select the ties for renewal on his section than any other individual, subject, of course, to a reasonable check by his supervisor or roadmaster to determine that the foreman is using good judgment.

J. B. Kelly (M. St. P. & S. S. M.) asked to what extent others thought a supervisor could check the ties on his territory, in these days of so many demands on his time, to which E. E. Crowley (D. & H.) replied that it was impossible for a roadmaster or supervisor to keep up with his regular duties and also find time to make the tie inspection on his territory. He added that on his road an estimate of the needs for next year is made in the fall of the year for the benefit of the purchasing department and in the spring the section foremen spot the ties that are to come out. He added that if a foreman is properly qualified, he is the best man to make such an inspection, because he knows his own section, and the ballast and traffic conditions better than anyone else. The foreman's tie count is submitted by miles and if any mile looks suspicious, the supervisor or roadmaster makes a check of that mile. A large percentage of the railroads, he thought, depend upon the section foreman to select the ties to be renewed.

Additional ties should be allowed where ballasting work is to be done, Mr. Crowley added, although under present conditions, with a shortage of ties, no ties should be taken out, even in connection with surfacing operations that will last another two years. When track is raised, however, ties that formerly appeared to have several years more service life will be seen to be ready for renewal. Mr. Crowley also stated that the re-use of removed ties in other tracks had very little economic justification.

Chairman Halverson stated that the committee felt that the section foreman is best qualified to select the ties to be renewed on his own section and that his count can be checked by supervisory officers and compared with the tie records for each mile of track to insure that his renewals are reasonable.

Elmer T. Howson *Railway Engineering and Maintenance*, pointed to the difficulty in determining how much the life of ties although, he said, there is no doubt that the unprecedented volume of traffic today is having its effect upon the life of ties in track. President Banion replied that there was no doubt in his mind that this traffic is accelerating mechanical wear and shortening the life of ties, but thought that the results might not be fully apparent for a few years.

Mr. Crowley cited some track with 12 to 14 in. of rock ballast and 131 lb. rail that had been surfaced out-of-face only a year ago, in which relatively few tie renewals were planned for the next two years. The traffic this year has been so heavy, however, that it became necessary to make considerably more renewals than anticipated to keep the track in good condition.

W. H. Sparks (C. & O.) said that the problem of tie renewals is not now one of economy or efficient tie renewal practices; the problem today and for the duration, since we have shortages of labor and of ties, is to make renewals on the basis of maintaining a safe track only. Mr. Sparks also agreed that the section foreman should make the tie inspection, sub-

ject to check by his supervisor and other officers. The foreman should also be allowed to exercise his judgment when making the tie renewals, he said, and use the ties that are available to the best advantage, perhaps renewing some ties that were not originally marked to come out and leaving others in that were marked during the inspection to be removed. This is necessary to make the best use of the new ties.

Mr. Gilkey said that on his road the section foremen make a detailed check of their ties in October and that their count is checked by the supervisor and division engineer. He added that his road is now renewing about 165 ties per mile annually, whereas at one time they had renewed as high as 500.

Educating Track Labor in the Salvage of Material

Report of Committee

BEFORE considering the problem of educating track labor in the salvage of material, the committee considered it advisable first to ascertain the attitude of several representative railroads relative to the importance attached to the salvaging of material and also to learn what methods they are using.

By contacting 16 railroads operating in all parts of the United States, we have found that 13 of them operate central reclamation plants for the sorting and classification of material for reuse and for scrap.

The methods employed and the extent of this work vary somewhat on the different roads, but our survey shows clearly the importance attached by the managements to the salvage of material. While the three remaining roads canvassed do not have central reclamation plants, they handle salvage by having their supervisors and section foremen classify usable materials at the section scrap bins and it is then forwarded to points where needed. By these methods, these railroads have shown their appreciation of the importance of the conservation and salvage of all materials.

Education Vital

The next problem then is to educate the track laborer in the importance of this activity since he is the man who uses and recovers material. We all realize that the war in which we are now engaged is a war of material. There are men in our employ, however, who do not fully realize the widespread shortage of material. This fact must be instilled in the mind of every person on our railways.

The consensus of the members of this committee is that the most effective manner of educating track forces is through frequent personal contact by roadmasters and supervisors. By this, we mean short talks to the foremen and men as to the primary importance of their picking up every piece of material, regardless of its size and whether it is of second-hand or scrap value.

In addition, division engineers and division roadmasters should hold occasional meetings, if possible, not only for the education of their trackmen in this subject, but also to secure their reactions and suggestions. These personal contacts and meetings should be supplemented at frequent intervals by bulletins and posters to keep this subject of salvage uppermost in their minds.

Since the responsibility for the education of track laborers in the salvage of material rests primarily with the foremen, supervisory officers must take the steps necessary to see that the foremen are properly instructed in this matter. In order to do this, frequent and thorough inspections must be made to see that all scrap and usable materials recovered in connection with work are taken to the tool houses daily and not left lying along the line to be picked up at some later time. This is a matter that cannot be stressed too much, and requires close supervision to see that it is done.

Avoid Surplus Stocks

Tool houses and supply yards must be checked and all surplus and obsolete materials disposed of in the proper manner. There has been a decided tendency on the part of some foremen not only to order too much material but to attempt to hoard materials against the day when they may need them. Control of this practice rests with the supervisory officers and it must be eliminated.

Practically all of the railroads have efficient stores departments that can and do furnish necessary emergency materials on short notice. For this reason, the foremen must be instructed to keep their emergency supplies to the lowest practicable minimum, and the amount they do keep should be approved by the supervisor or roadmaster.

In the past there have been cases where material has been hidden. This has usually resulted in material being lost. This practice, if it exists, should be eliminated.

All foremen should be instructed in the importance of the careful ordering of material, and very close scrutiny and investigation should be made by officers before they approve requisitions. By so doing, surplus ordering of material will be avoided, or at least kept to the minimum. This also applies to the officers of the stores department, in order to eliminate the unnecessary and extravagant issuance of material.

Avoid Loss of Materials

As one phase of his education, certain practices in the handling of materials should be brought to the foreman's attention. For example, it is not good practice to distribute materials (especially of the smaller types) too far in advance of the time of their use; theft may occur or children may be tempted to place the small materials on the rails, with resulting serious accidents.

The average track man does not fully realize the cost of the material he is using, and for this reason does not appreciate how much money and effort are wasted by his failure to pick up a few spikes, for example, which happen to become covered up and lost. While the amount of the loss of money and material in this one case appears trivial, if it occurs in a number of cases over an entire system, the loss is great. In most cases, this is not the fault of the track man, since he has not been informed as to the approximate cost of the different items he uses daily or in the course of a week. Rather, this is a matter of education and he should be instructed by the foreman as to the cost especially of the smaller items, such as bolts, spring washers, spikes, etc., which are easily lost. If this is done, in the majority of cases, it will give these materials a new significance and

Materials Held at Tool Houses Should Be a Minimum, Consistent With Essential Requirements

will tend to help in their salvage.

If all maintenance men, as well as the men in other departments, are always on the alert and will give some thought to salvage, ingenious methods can be devised. For example, one railroad has provided its switch engines with material boxes in which members of the switching crews throw spikes and other materials which they pick up incident to their yard operations, the material so collected being dropped in a central bin. The amount of material recovered in this manner is reported to be large. It naturally follows that a thorough and complete job of salvage requires the concerted action and co-operation of all employes.

Conclusions

In summation, your committee believes that the education of track labor in the salvage of material can best be accomplished by:

1. Frequent personal contacts with the laborers.
   (a) Instruction by supervisors of foremen and men with regard to the best methods and practices for salvage.
   (b) Meetings at frequent intervals to instruct and impress upon these men the full importance of this matter.
2. Bulletins and posters to the foremen and men, stressing the salvage of all material.
3. Personal inspections by supervisors to see that:
   (a) Material stocks are kept to a minimum.
   (b) Proper disposition is made of all obsolete or unused materials.
4. Supervisory officers seeing that all foremen are instructed as to—
   (a) The amount and kind of emergency materials to be kept on hand.
   (b) The recovery and transfer of all scrap and surplus material to tool house daily.
   (c) Full appreciation on their part and on the part of their men of the acute and widespread shortage of material.
5. All men in supervisory capacities doing all that they can to cause everyone on the railroads to become acutely "scrap conscious," and to enlist the concerted action and co-operation of every employee in this matter.

C. F. Edwards (chairman), asst. div. engr., C.&O., Columbus, Ohio; I. B. Clontz (vice-chairman), rdm., Sou., Rock Hill, S.C.; J. S. Anthony, supvr., Sou., Stratsburg, Va.; W. F. Bugbee, Eastern Ry. Supplies, New York; W. F. Chapman, div. engr., C. of Ga., Columbus, Ga.; B. Clark, trk. supvr., C&E.I., Watseka, Ill.; Ralph E. Cramer, University of Ill., Urbana, Ill.; W. L. Fowler, div. rdm., D.M.&I.R., Two Harbors, Minn.; A. J. Johnson, rdm., C.&N.W., Redfield, S.D.; John Kirkland, supvr., C.R.I.&P., Topeka, Kan.; F. H. Masters, ch. engr., E.J.&E., Joliet, Ill.; V. P. Shepardson, rdm., T.C.& I., Ensley, Ala.; J. L. Tedesco, trk supvr., Penna., Cadillac, Mich., and O. H. Woolwine, asst. supt., N.&W., Norfolk, Va.

Discussion

Opening the discussion of this subject, President Banion stressed the large economies that are possible in a conscientious effort to pick up all released material, and, more particularly, in the salvage of all usable materials, especially in the light of the shortages that prevail in many of these materials. He also said that this effort to round up and salvage materials must apply with equal force to the salvage and reclamation of tools and roadway machine parts.

N. D. Howard *(Railway Engineering and Maintenance)* recognized the importance of the factor of economy in promoting scrap drives and reclamation, but said that emphasis today could be placed to advantage upon the patriotic appeal to help in the war effort, and to make available to the railways themselves materials and parts which, because of shortages, might not otherwise be available to carry out essential work. President Banion mentioned, in addition, the value of picking up scrap material which might cause personal injury, or which might be used by trespassers to cause train accidents.

W. H. Sparks (C. & O.), referring to the days when track materials were light and inferior to those employed in present-day construction, told of the not-uncommon practice in those days of foremen hoarding materials to protect their needs in making necessary replacements and repairs. "Today," he said, "with stronger and sounder track materials, the same incentive to hoarding does not prevail, and the practice has been largely discontinued." However, he cautioned that there are still those who will build up unnecessary local reserves upon which to draw unless they are prevented from doing so. To eliminate this practice entirely, which he pointed out is necessary in the interest of the proper distribution of all of the materials that are now available, he urged further education of foremen in this regard.

Speaking of picking up released material, he cited, in particular, the importance of segregating and listing all materials released in rail relay work, pointing out that unless this

Closest Attention Should Be Given to Retrieve All Usable and Scrap Materials Released in Rail Relay Jobs

is done, large amounts of material with remaining service life will be lost with the scrap.

Closing the discussion, President Banion directed attention to the importance of reclaiming the salvageable parts in otherwise scrap frogs. He said that the track forces should not attempt to be the judge of what parts are salvageable and what parts are not, but should turn all units and parts over to the proper department where salvageable and scrap materials can be separated properly.

Round Table Discussion

Following the presentation of the committee reports, the meeting was opened for the discussion of any problems that those present wished to consider and a number of interesting subjects were discussed at some length. An abstract of this part of the meeting follows:

Self-Guarded Frogs

What Effect Do Self-Guarded Frogs Have on Rolling Stock?

F. G. Campbell (E.J.&E.) asked this question, because his mechanical department has complained that self-guarded frogs are causing damage to wheels of locomotives and cars. J. B. Kelly (M.St.P.&S.S.M.) stated that his road had a heavily-used lead track in its yard 17 miles west of Chicago on which there were about 25 No. 9 turnouts, all with self-guarded frogs. This lead, he said, was formerly hard to maintain, but since they have installed self-guarded frogs, they have had very little trouble and no complaints from the mechanical department. Similar experience was reported by E. E. Crowley (D.&H.), who explained that his road has had self-guarded frogs in service in yards for 15 years and has never had any complaint concerning them. He added that if any trouble should occur it would probably be due partially to the mechanical equipment.

E. J. Brown (C.B.&Q.) said that he had received complaints from the mechanical department that such frogs damaged the wheels on cars and caused slipping of tires on the drivers of locomotives, but that investigation showed that trouble was experienced only with wheels with false flanges or worn treads. They have never had a complaint, however, in a large hump yard which has a large number of self-guarded frogs.

A. B. Hillman (C.&W.I. and B.R. of C.) said that they do not use self-guarded frogs because several roads operating in their Chicago yards use locomotives with blind drivers. He stated that complaints had been made, however, of damage to wheels caused by manganese frogs and investigation had shown that the damage was due to wheels with defective contours. Some of the wheels had a bead on the rim and a chipped rim resulted.

F. E. Schaumburg (C.&N.W.) stated that he had had no complaint against self-guarded frogs, except in a few cases where locomotives from other roads were equipped with blind drivers. Mr. Schaumburg also said that his road had equipped a number of double-slip switches in the Chicago terminal with self-guarded frogs on the ends. These switches are used by passenger equipment and so far they have had no complaint. President Banion summarized the discussion with the statement that self-guarded frogs are satisfactory for yard use from a maintenance standpoint and that no trouble should arise if the mechanical equipment passing through the switches is in good condition.

Laying Rail and Surfacing Against Traffic

Should Rail Be Laid and Track Be Surfaced Against Traffic in Double-Track Territory—Why?

This question created considerable discussion, nearly all of which was in the affirmative: E. J. Brown (C.B.&Q.) said that they consistently lay rail and surface track against the current of traffic on double-track territory unless there is some special condition that makes it advisable to disregard this rule. While this rule may be more or less of a tradition, he said, nevertheless, working against the current of traffic is a safeguard because the anti-creepers on the undisturbed track keep the rail from running with the traffic. This helps prevent sunkinks in surfacing work and also helps to maintain the desired expansion in rail-laying work until anti-creepers have been fully installed on the new rail.

F. E. Schaumburg (C.&N.W.) agreed with Mr. Brown that the practice of laying rail and surfacing against the current of traffic on double tracks was desirable because the traffic does not then do so much damage to the work. He also expressed the view that this is desirable from a safety standpoint, because the men are looking in the direction from which traffic is coming.

President Banion inquired if there was any advantage in working against the normal current of traffic if the track is killed, to which Mr. Schaumburg replied, that under those circumstances there was no particular advantage in working in either direction.

W. H. Sparks (C.&O.) explained that his road used to lay rail with the traffic but now works against the current of traffic. He agreed that the expansion in the new rail could be held better when the latter procedure is used. In connection with this problem, Mr. Sparks warned that with the toeless joint bars now in general use, the expansion must be watched closely because he had frequently observed joints with apparently the right amount of expansion at the top but actually with no expansion because there was no gap at the base of the rails.

In surfacing track, it is better to work against the current of traffic, Mr. Sparks said, because it is better to have the trains pass from the solid undisturbed track to the run-off and the newly-surfaced track than vice-versa. With this practice, any tendency of the rail to run with the traffic can be gradually dissipated, whereas, when traffic passes from the newly-surfaced track onto the solid undisturbed track, any tendency of the rail to run with the traffic is stopped suddenly, creating the possibility of a kink. The braking of the train as it slows down when approaching the surfacing work adds to this effect if the work is being done with the current of traffic. In this connection, he warned that the track should be filled in behind the tampers as the work progresses.

Increasing the Labor Supply

What expedients are the railroads using to increase the supply of labor for trackwork?

This question was raised by Elmer T. Howson *(Railway Engineering and Maintenance)*, and aroused an interesting discussion. E. E. Crowley (D.&H.) said that the shortage of labor on his road was particularly acute on two divisions where labor was attracted elsewhere by higher wages in industries. On these divisions, he explained, they had no housing facilities for labor. To offset the shortage, they canvassed the principals and superintendents of schools in the area before school closed last spring to secure boys 16-18 years old for work during the summer and from Albany, N.Y., for example, they secured 60 boys.

Before being hired, Mr. Crowley explained, the boys were told that they were taking on a "tough" job. In spite of this, many signed up. Some were too light for the work, a few wanted to play on the job and a few asked to be relieved in a short time. The majority stayed, however, he said,

and those who stayed took hold in a remarkable way and in a short time were able to hold their own with regular men. Analysis of the time worked by the boys showed that the amount of lost time was negligible. At first the state labor board would only let the boys work 40 hrs. per week, but later the railroad got permission to work them 48 hrs. per week. When school started, they went back, but many of them asked to continue working on Saturdays and are doing so.

President Banion said that the Santa Fe was having most of its trouble in securing an adequate supply of track labor in areas near defense industries. He said that they had recruited some high school boys and had done a large amount of light surfacing and spotting with these boys, using the trowel method of tamping, a method which enabled them to work over a large amount of track, some of the gangs covering as high as 1,000 ft. of track a day. Mr. Banion said they had also succeeded in getting a good many miles of track surfaced with Japanese labor. The Santa Fe, he said, had also imported many Mexicans and they were laying a mile of rail a day and doing a lot of surfacing with this labor. In taking care of the Mexican gangs, they made timekeepers and assistant foremen of local Mexicans and the arangement had proved very satisfactory.

J. B. Kelly (M.St.P.&S.S.M.) said his experience in hiring high school boys had been similar to that of Mr. Crowley, but that he had not been able to recruit any high school boys from cities or areas near defense plants, where the wage rates were high. He had secured boys from the smaller towns, he said. At one point where they secured 50 boys, they hired the athletic coach to serve as assistant foreman and take care of the boys and were well pleased with the results obtained.

E. J. Brown (C.B.&Q.) explained that they were very short of track men in the Chicago metropolitan district and as far out as 80 miles from Chicago. He stated that they had tried practically all of the expedients already discussed. During the summer they hired high school boys and also the school principal as timekeeper. Boys on a rail gang, he said, did good work. The Burlington has two Jap camps, he stated, and the Japs make excellent track workers and like the work. They also maintain exceptionally clean, well-kept camps.

His road also has a serious labor problem, according to W. H. Sparks (C&O.), who said that gangs of 60-80 men had dropped to as low as 18-20. Labor secured from the mountain areas of Kentucky and West Virginia helps fill the ranks and they have also hired quite a few boys. On some sections, he added, the road lost all its men and replaced them with school boys. The school boys are very willing, Mr. Sparks said, and learn fast, but the foremen must be cautioned to take the time to teach them all phases of the work.

Tractor-Type Mowing Machines

How do the light hand-operated power mowing machines with one-cylinder engines compare with tractor-type mowers, like those used by the highway departments, for right-of-way mowing?

President Banion favors the tractor-type mower as far superior for general right-of-way mowing since it is designed for heavy work and will cut brush, barbed wire, etc. Mr. Crowley also added that the tractor-type machine will do more mowing, which will offset its higher cost.

E. J. Brown (C.B.&Q.) contended that each machine has a place. If all of the right-of-way must be mowed, the tractor-type machine is much better, partcularly over rough ground and in heavy mowing, but for a small amount of mowing at various points, such as around highway crossings, in terminals and places that are hard to get to, the two-wheeled power mower is very convenient. A. B. Chaney (Mo.Pac.) agreed with Mr. Brown and stated that the tractor-type machine is superior for heavy-duty mowing of the entire right-of-way.

The Track Supply Association

THE decision of the officers of the Roadmasters' and Maintenance of Way Association to forego their annual meeting this year automatically eliminated the possibility of the Track Supply Association presenting its annual exhibit of products. However, it is doubtful if these manufacturers would have been prepared to present an exhibit on a scale comparable with those of previous years, because of the concentration of so many of them on the production of materials employed in the war effort and the shipment to the railroads of every other unit not required by our armed forces. These manufacturers also desire to join with the roadmasters in reducing the demands on the railways at this time when their facilities are taxed with military and civilian traffic.

Since the first meeting of the Roadmasters' Association in 1883 and even more directly since the organization of the Track Supply Association in 1910, those who have attended the annual meetings of the Roadmasters' Association have profited greatly from the opportunity afforded to study and examine full size units of practically all of the tools, materials and appliances available for use in their work. No better measure of the appreciation manifested by the roadmasters of the value of this exhibit can be offered than the fact that their selection of the place for their meeting is always predicated on the requirement that adequate accommodations must also be available for the exhibit.

The officers of the Track Supply Association, who have carried on its activities since its last exhibit a year ago, are as follows: President, H. C. Hickey, The Rail Joint Company, Inc., Chicago; first vice-president, H. M. McFarlane, O. F. Jordan Co., East Chicago, Ind.; second vice-president, Thomas D. Crowley, Thomas D. Crowley & Co., Chicago; secretary-treasurer, Lewis Thomas, Q. & C. Company, Chicago; directors, F. A. McGonigle, Mall Tool Company, Chicago; L. I. Martin, Morden Frog & Crossing Works, Chicago; H. A. Morrison, Railway Engineering and Maintenance, Chicago; R. M. Blackburn, The Buda Company, Chicago; C. B. Armstrong, Air Reduction Sales Co., Chicago; C. O. Jenista, Barco Manufacturing Co., Chicago; and J. B. Templeton, Templeton, Kenly & Co., Chicago.

A Message from the President and Secretary

Since 1910 it has been the privilege of the Track Supply Association to participate in the annual convention of the Roadmasters and Maintenance of Way Association of America and to introduce and display the products of member companies. Through these years the members of the Track Supply Association have looked forward to these conventions as opportunities to renew old acquaintances and to

meet those who are coming into supervisory positions of responsibility in track maintenance. They deeply regret the conditions that made it advisable for the Roadmasters to forego their meeting this year. For this reason they appreciate the invitation afforded them to join in this Roadmasters Convention in Print issue of *Railway Engineering and Maintenance*.

From the first meeting of the Roadmasters Association in 1883, manufacturers of track materials, tools and equipment have displayed their products in every year in which the Roadmasters have met except 1893 and 1904. In 1910 the Track Supply Association was formed to put these exhibits on an organized basis and has since presented an exhibit in each year except in 1931, 1932, and 1933, when the Roadmasters held no conventions. The Track Supply Association is proud of this connection with the oldest of our railway organizations — the Roadmasters Association — which held its fifty-seventh annual meeting last year.

Starting with 20 members in 1910, our Track Supply Association has enjoyed a healthy growth until it now comprises 65 firms. We are proud also that our exhibits have expanded in scope and improved in educational value from year to year with respect both to the number and variety of the products shown and the amount of space occupied by our display. Furthermore, our relationship with the Roadmasters and Maintenance of Way Association has become more intimate from year to year until we have come to be considered an integral part of the Roadmasters meetings.

While many of our member companies are now actively engaged in producing materials for our armed forces, they are also making every effort to supply the railways with the materials that they need to maintain their tracks and structures in condition to carry the greatest volume of traffic that they have ever experienced. Our members are ready at all times to assist the railroads in obtaining the best and most economical use of our materials and equipment, as well as to find alternate materials in place of those which are now "critical" and difficult to secure, and are making liberal and judicious use of the advertising pages of the railway publications to further inform you of our desire to be of service.

Our Board of Directors is keeping our organization intact and functioning and is holding meetings from time to time as necessary to consider the problems that arise. In this they are supported by a loyal group of 65 member companies. The officers and directors of the Track Supply Association look forward hopefully to the time when the successful culmination of our nation's war effort will permit our association to join with the Roadmasters Association again in resuming our normal activities.

Buckled Track Causes Derailment

ON July 19, a southbound freight train on the Missouri Pacific was derailed near Vaughn, La., causing the death of the flagman and injuring the conductor. According to the report of the Interstate Commerce Commission, from which this information is abstracted, this accident occurred on a single-track line, which is tangent for 2.3 miles north of the point of derailment and for 8.3 miles beyond it. Approaching from the north there is a descending grade of 0.53 per cent for 3,900 ft., followed by a vertical curve 800 ft. long, and 993 ft. of level track to the point of accident. For a mile beyond there is an ascending grade ranging from 0.27 to 0.51 per cent. The track where the derailment occurred was, therefore, in a sag.

At this point the embankment was about 12 ft. high, the track was laid with 85-lb. rail, 33 ft. long, with 20 ties to the rail length. The ties were fully tie plated, the rail was single spiked, and the track was ballasted with gravel and cinders to a depth of about 8 in. The south abutment of a 22-bent pile trestle 295 ft. long was located 39 ft. north of the point of derailment. For a considerable distance immediately south of this bridge there was practically no ballast above the level of the bottom of the ties, and for 2,000 ft. north of the bridge to 6 ft. south of it, there were no anti-creepers on the rail.

The train involved in the derailment consisted of a locomotive, 48 cars and a caboose. While this train was running at a speed estimated to be 30 miles an hour, the rear truck of the 45th car and all following cars were derailed. These cars, except the 45th car, which remained upright, stopped, badly damaged, in various positions west of the track about 400 ft. south of the point of derailment.

After the accident, a section of track about 25 ft. long, beginning 31 ft. south of the bridge, was found to be buckled to the left, the maximum deflection being 11½ in. Marks on the base of the rail on the bridge and for some distance north of it indicated that the rail had crept. The foreman stated that he had inspected the track about five hours prior to the accident, which occurred at 1:30 p.m. in clear weather and a temperature of 94 deg., that he used a considerable part of the ballast to keep the track surfaced, and ballast to refill the cribs had not been furnished.

The commission concluded that creeping rail induced by lack of anti-creepers, combined with high temperature and lack of resistance to lateral movement, resulted in kinked track which caused the derailment.

Bank Widening on the Rock Island in Oklahoma With an American Gopher

Pennsylvania Meets Test of Trainshed Fire

(Continued from page 751)

truck-mounted cranes, while contractors furnished 6 additional units of various types. Furthermore, the road had three crawler cranes operating on flat cars in work trains, and a number of additional cranes handling material at the different yards.

Other equipment that was used included 60 automobile trucks, 3 large truck tractors with heavy-duty trailers, 14 generators, 7 air compressors, several crawler trailers with winches, 7 oxyacetylene outfits, and 1 power drill. To permit persons working on the job to be quickly located for answering telephone calls, a public address system was installed, with loudspeakers placed at strategic points. Also, a comprehensive system of flood-lighting was installed to illuminate the area for night work.

Manpower

Some indication of the speed with which the reconstruction work got under way is given by the fact that during the night shift following the day of the fire there were 603 men engaged on the repairs. During the 24-hr. period ending at 7 a.m. Tuesday (September 14), a total of 2,176 men were engaged on the two shifts. The peak of activity was reached in the 24-hr. period ending with 7 a.m. Friday when 2,474 men were employed, including 170 maintenance of way and structures foremen, 966 carpenters, 325 mechanics and 968 laborers. This figure also included 9 foremen, 32 mechanics and helpers and 4 laborers from the maintenance of equipment department. From this high, the number of men engaged in the undertaking fell off rapidly as the various items of work were concluded successfully.

The foregoing figures on employment include both the regular forces of the railroad and those of the contractors who assisted in the work. Of the railroad employees, 425, consisting of carpenters, other mechanics and track men, were housed in 17 camp trains that were assembled at the company's Overbrook yard on the outskirts of the city. These were the outfits of the various gangs that had been brought in from other parts of the Eastern region. They included a total of 52 sleeping cars, 26 cooking-dining cars and 16 recreation cars. This yard is situated about five miles from the station, and the employees were transported to and from the job in trucks. Special arrangements were made with nearby restaurants to feed the men during the lunch periods, while temporary rooming quarters were also established in the upper floors of the Broad Street station for housing additional workmen.

Nature of Shoring

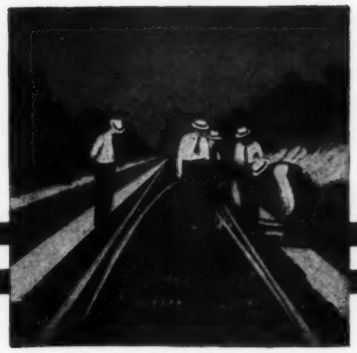
As noted previously, the supporting steelwork in the trainshed area remained generally in position, although much of it, especially the longitudinal girders, suffered considerable distortion because of the heat. Except for certain members that were so badly warped as to require removal, the steel was left in place and was shored up with an extensive system of timber frame bents. At some locations, the track ties and the supporting members for the platforms could be laid directly on the steel, but at other locations, the distortion of the girders was such that the timbers had to be shimmed up on them. At still other places where the steel was badly warped, the tracks and platforms were supported directly on timber trestling placed between the girders. As assurance against future fires at this location, consideration is now being given to the installation of a system of fire walls under the trainshed area. Also, the baggage room and other facilities under the track level are being restored with fireproof construction.

For various reasons, the repair work was started on the north side of the area and was carried progressively across it to the south side. In restoring individual tracks, the work was begun at the west end of the area where the presence of existing tracks made it possible to bring carloads of material directly to the site where they could be unloaded and handled into position with the Burro cranes.

From the start, it was obvious that one of the most important factors in assuring rapid prosecution of the work was the attainment of a high degree of co-ordination between the various operations involved, namely, the removal of the debris and damaged material, the installation of the shoring, the construction of the platforms, the laying of the tracks, and the restoration of the catenary wires. This was so because the procedure adopted contemplated restoring the tracks by pairs, and it was necessary, in the interests of returning them to service as rapidly as possible, that all phases of the work for each pair of tracks be brought to a conclusion at about the same time. This situation, incidentally, provided an opportunity to achieve a spirit of competition between the forces engaged in the various phases of the work, which helped materially to expedite the operations.

At 5:45 a.m. Wednesday Track 15 was restored to service, being followed by Track 14 at 12:10 p.m. the same day. Thereafter, the tracks were restored to service at the rate of about two each day, the last two (Tracks 2 and 3) being declared ready for service at 10:15 p.m. on Sunday, September 19, just seven days after the fire occurred. Incidentally, Tracks 16 and 1 are not being replaced at this time. In the beginning, a schedule was set up which contemplated that the last track would be back in service by Tuesday, September 21—hence, it is evident that this schedule was beaten by two days. Except for odds and ends, it is expected the trainshed area will be completely restored by October 1.

By Sunday, September 19, One Week After the Fire, All Trains Were Operating Into and Out of the Station On a Normal Basis



What's the ANSWER?

Are Lookouts Desirable?

Considering the present density of traffic and speed of trains, to what extent is it desirable to place lookout men to protect track or bridge gangs? Does the character of the work make any difference?

Uses Whistles

By R. L. Fox
Roadmaster, Southern, Alexandria, Va.

This is a question that concerns every maintenance of way employee, especially on those lines upon which traffic has increased to more than double that of 1939. With this increase and the increased speeds that mark all train operation today, it has been necessary to revise methods of maintaining tracks and structures, by using off-track equipment so far as possible. Yet, even with this equipment, the men in the gangs must occupy tracks to renew ties, surface and line, and here we encounter our worst problem, because to do this class of work we have special gangs which are equipped with power tampers.

A few years ago, we did not restrict the speed of trains by train order when surfacing gangs were working, but we did set up caution boards which require trains to reduce speed. As traffic increased, we issued train orders restricting the speed of second and third-class trains to 10 miles an hour where surfacing gangs were working, stating in this order the starting and stopping time of the gang. The track was kept safe for the passage of trains at restricted speed and in good condition for first-class trains.

As traffic continued to increase, our first-class trains began to be operated in as many as six sections, and to keep the track safe for this number of trains without restricting the speed by train order, the amount of work done by our forces was reduced considerably. At present all trains receive train orders to reduce speed to ten miles an hour where a gang is working.

In addition to this protection, we have equipped our air compressors with whistles which are blown by the operator to warn the men that a train is approaching. The foremen of gangs using electric tampers use a police whistle to warn their men. When either of these gangs is working on a curve, a lookout man is placed to give the warning. We have found that with train orders, the engineer knows where the gang is working and sounds his whistle, giving the men time to clear the track.

Where section and bridge gangs need protection, they use lookout men, and where necessary they are protected by train orders.

A Safety Measure

By L. G. Byrd
Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Present traffic is so important and prompt delivery at destination so essential that every effort should be directed to the elimination of delays. Restricted speed and stop signals should be set out only when it becomes absolutely necessary to slow down or stop trains. However, power tools are often used on bridges, or near them, such as rivet busters, rivet hammers, scrapers, concrete mixers, etc., that create so much noise that the men cannot hear the approach

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in December

1. In view of the present density of traffic, how should ties for next year's renewals be shipped and distributed to conserve cars? When should this be done?

2. To what extent is it feasible to substitute wood for metal doors? What precautions should be observed?

3. What precautions should be observed in the application of shims to heaving track? Should shimming be done under flag protection? Why?

4. In view of the present difficulty of obtaining structural timbers, is there any objection to using stringers of single-span length for open-deck trestles? Why? Are there any advantages?

5. Where traffic is heavy and train speeds high, should spikes that are driven tightly against the rail be raised slightly prior to cold weather to prevent their breaking when the track becomes frozen solidly? Why?

6. What measures should be taken at this time to prevent water-service facilities from freezing? Who should do this?

7. What type of organization is desirable for field maintenance of power machines and tools? What are a field mechanic's functions? To whom should he report?

8. In what ways do present shortages in labor and materials affect the regular inspection of buildings? What items should be observed particularly at this time? Who should make the inspection?

of a train. This is also true of tie tampers used by section and extra gangs. With four to eight tampers in operation it is practically impossible to hear a train, even though the engineman uses his whistle.

A lookout man should serve as an important safety measure when power tools are in use on or near the track, and should save delays to fast trains. He should pay large dividends where large forces of trackmen are working on long ballasted-deck bridges. The foreman needs the assistance of such a man, as he is often engaged in work that requires all of his attention, so that he cannot keep a close lookout for approaching trains. This does not mean that a foreman should be permitted to obstruct the track in any way without first displaying stop signals in both directions.

A Different Tone

By District Engineer

Recognizing the hazards surrounding track and bridge work, the railways have taken precautionary measures to insure the safety of men engaged in such work. Rules of conduct have been established for their protection, and these have been supplemented by oral instruction in safety practices. If these rules are strictly enforced, accidents will be greatly reduced. Yet, with the marked increase in traffic and train speeds, added precautions are often desirable.

While the practice of using lookout men, especially with large gangs, is not universal, it is followed on many roads. Under present conditions it rises to the same importance as dependable flagging. However, because of the widely varying conditions under which these classes of work are carried on, it is impossible to set forth definite and categorical rules for the use and placing of lookout men. The foremen of small gangs on lines of light traffic should be able to protect their men without the assistance of lookout men. On the other hand, large gangs working on multiple-track or high-speed lines should have regular lookout men to warn of approaching trains. Multiple tracks and adverse weather increase the hazard. Work requiring men to occupy the track should be suspended during heavy fog.

Sound-producing tools require extreme vigilance. In addition to the noise they make, they set up vibrations that interfere with the normal sense of hearing. A recent accident which resulted in the death of nine men in one section gang illustrates what may happen when using percussion tools. In this case, the men were operating tie tampers and did not hear the warnings shouted to them by their fellow workmen. This emphasizes the need for some sort of a warning device that will produce a distinctive and unusual sound that can be heard above those produced by the machines in operation. Even when machines that are less noisy than tie tampers are in use, the human voice alone is not sufficient as a warning. It requires a tone that differs distinctly from those that produce the noises of the machines. A shrill piercing whistle produces the most effective tone for their purpose, and all lookout men and others charged with warning their fellow workmen of the approach of trains should be provided with whistles similar to those used by traffic officers.

It should also be borne in mind that the intensity of sound varies as the square of the distance from its source. For this reason, lookout men should be stationed near enough to be heard by all of the workmen. In exceptional cases, as on high-speed curves in deep cuts or where the view is obstructed otherwise, it may be advisable to post lookout men in relays. In any event, they should be thoroughly acquainted with their duties, and should be selected for their alertness and dependability.

Substitutes for Metal Pipes

To what extent can the use of critical materials in pipe lines be avoided through the use of substitute materials?

Glass Is the Latest

By C. R. Knowles
Superintendent Water Service (Retired)
Illinois Central, Chicago

Critical materials used in the construction of pipe lines, in the reverse order of the supply available for civilian use, are copper, brass, wrought iron, steel, lead and cast iron. Cast iron is placed last because the cast-iron pipe situation has eased somewhat during recent months. Materials used as substitutes for the larger sizes of pipes are asbestos-cement, concrete, wood-stave and vitrified-clay pressure pipe. Substitutes for the smaller sizes are plastic, fibre and glass pipe. Some of these so-called substitute materials have been used for many years, wood pipe being the earliest form used in this country, but plastic and glass pipe for general use are recent developments. Asbestos-cement pipe should more correctly be called a competitor of cast iron and steel pipe, for it has been used extensively, even in normal times, where these metal pipes were formerly used. Vitrified-clay pressure pipe for heads up to 100 ft. is now in the process of development. Increased use of wood stave pipe has resulted more from increased activity on the part of the manufacturers than from inherent advantages of their product. Marked progress has been made in the development of substitute materials for the smaller service lines, notable examples of this being plastic and glass pipe.

Plastic pipe has many unusual qualities and should be satisfactory for many kinds of service. It is tough, durable and resists corrosion, abrasion and incrustation. It is lighter than other pipe, weighing approximately one-fourth as much as standard iron pipe. It may be welded readily at relatively low temperatures, 350 to 400 deg., by using a hot plate or a blow torch. It can be threaded with standard pipe dies and is adapted for use with standard fittings. It is made in sizes up to 3 in., and a limited number of plastic fittings, such as tees, elbows, flanges and couplings are on the market. This pipe is not suitable for carrying water or other liquids at temperatures higher than 175 deg.

Glass pipe is the latest development. According to the magazine, Commerce, one chemical concern has installed 27 miles of glass pipe in a plant it constructed recently. A manufacturer has pre-fabricated glass shower sets of three to five pieces. The glass used for these purposes is much stronger than ordinary glass and has a remarkably low expansion and contraction factor under temperature changes. It resists incrustation and is easily cleaned. It will undoubtedly be used widely, especially in plumbing installations when wartime priorities are lifted.

Fibre pipe, made of cellulose fibre impregnated with coal-tar pitch, is a development from electric conduits of the same composition, which have been used for many years. Cast iron pipe in the small sizes is being substituted for similar sizes of wrought iron and steel pipe in many instances. It is made with either precalked bell

and spigot joints or with threaded ends. The smallest size is 1¼ in.

Substitutes for critical materials used in pipe lines cover practically the entire field of piping, although there are certain classes of service in which substitutes cannot replace metal pipe. In others, their use means the sacrifice of durability; in still others, they may be better than metal piping for certain service conditions. Therefore, the conditions under which the substitute pipe is to be used must always be given careful consideration.

Difficult to Do

By H. E. Donovan
Water Inspector, Chicago, Milwaukee, St. Paul & Pacific, Chicago

Owing to the nature of pipe-line construction and the trouble-free service expected of pipe lines, it is difficult in most cases to substitute a non-critical for a critical material. Generally speaking, the approach is to substitute a material that is less critical than the one commonly used.

Probably the most common substitute for cast-iron and steel pipe and, in some cases, for lead and copper pipe, in underground construction, has been asbestos-cement pipe. In the majority of installations, this substitution can be made satisfactorily, although adequate cover must be provided to prevent any chance of freezing. Since asbestos pipe is a non-conductor of electricity and a poor conductor of heat, it is quite difficult to thaw a pipe line of this type. While not in extensive use as yet, although apparently a dependable material, Saran, a plastic pipe, may gain popularity and partially replace steel, copper and lead pipe in the smaller chemical and cold water lines.

The most critical material in general use in pipe-line construction is copper in the form of brass. In designing piping systems, care should be exercised to eliminate all unnecessary brass valves. It is possible, in the smaller lines, say up to 3 in., to substitute iron cocks for the more critical brass gate and globe valves. This is true particularly where a valve is provided chiefly for emergency shut-off purposes and is seldom used. If a valve requires consistent usage, and the use of the iron cock is not advisable, consideration should be given to the installation of an iron-body brass-fitted valve in preference to an all-brass valve. One satisfactory substitute for the large gate valve (16 in. and smaller) located in the water column lines leading from storage tanks, has been the all-iron "halliday" valve, which is installed in the tank. In addition to conserving critical material, the installation cost is lower.

Dry braided Fibrex, a paper-like material, is recommended as a substitute for the more critical jute, oakum and hemp, for calking bell-and-spigot pipe. Sulphur-base compounds have been in common use for many years, and they can be used as substitutes for pig lead.

In short, while it is possible to conserve some critical materials in pipe-line installations, the decision as to what substitutes are advisable should be arrived at carefully, keeping in mind the various conditions under which the system is to operate.

Cannot Avoid Entirely

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

The use of critical materials cannot be avoided entirely in pipe lines, but less-critical materials may be, or may have to be, substituted for the more critical items. Copper tubing is out for ordinary purposes and iron or steel pipe may be substituted. Galvanized steel pipe is preferable for lines carrying drinking water, with wrought iron next, if it can be obtained. For air, steam and non-domestic-water lines, black-iron will serve.

If galvanized or wrought-iron pipe is not obtainable for drinking water, black pipe may be substituted and no one will be poisoned as a result, although the black pipe may have a shorter life and the water may be somewhat discolored at times. Medium cast iron pipe, uncoated, may be substituted for heavy, dipped cast iron for purposes where the heavy pipe is not absolutely needed, and triple-strength vitrified clay pipe may be substituted for both in many low-pressure and non-pressure pipe lines. Reliable substitutes for tubing are in the making and are being tried out, but during this emergency wholesale replacements are limited by lack of man-power. Pipes now in service should be made to do, so far as possible, by welding or patching.

Placing Cinders on Shoulders

In view of the increased supply of locomotive cinders, is there any advantage in placing them on the shoulder of embankments? Any disadvantage? Should the shoulder of the roadbed be lowered before the cinders are placed? Why? How?

There Are Complications

By F. G. Campbell
Assistant Chief Engineer, Elgin, Joliet & Eastern, Joliet, Ill.

This is a general question that is fraught with complications, for the accumulations of cinders at pits must be disposed of, and the disposal cannot wait upon the convenience of the maintenance of way department; it must be made quickly and at frequent intervals. The frequency will depend on the capacity of the pit and the number of cars available for handling the cinders. Whether these cinders should be applied in the widening of embankments where, as a rule, they will become a permanent improvement to the property, or whether they should be unloaded on a waste dump, will often depend on circumstances over which maintenance officers have no control, such as the availability of work trains and labor for handling the cinders, and the interference of the unloading operation with revenue traffic.

Generally speaking, the placing of these surplus cinders on the sides and shoulders of embankments is a decided advantage. If done properly, it improves drainage and will retard the growth of vegetation. In general, railway embankments are none too wide at the shoulder and any additional width that can be obtained is usually of either immediate or future benefit. However, the additional cost of such disposal, over that of wasting on a convenient dump, where no work-train service is required, may more than offset this advantage. Even when this additional cost is justified, labor to handle the cinders may not be available, or, if available,

can be used only at the sacrifice of essential work.

Summing up, the advantages of placing cinders on the shoulder of the embankment are that it will provide better drainage, it will retard the growth of vegetation and, often, will provide needed additional width for the shoulder. The disadvantages are increased cost, interference with revenue traffic and the use of labor that is badly needed at present on other work.

The shoulder of the roadbed, especially when the embankment is constructed of clay or other impervious material, should be lowered from six inches to one foot before the cinders are placed, to obtain full advantage of the better drainage that is provided by the cinder fill. In some cases, the lowering of the shoulder will release water that is being held in pockets in the ballast. The lowering of the shoulder can, I believe, be accomplished best with a spreader plow propelled by a locomotive.

Makes a Better Roadbed

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

This question touches upon a matter that is worthy of the serious consideration of maintenance officers. In the past, cinders have not been sufficiently plentiful to permit their being used widely for the purpose suggested, although the need for them in this service has always existed. In the past, too, there was a greater demand for cinders for ballast purposes than there is now, for locomotive combustion has improved to the extent that the coal is more nearly consumed. This may have improved locomotive performance, but it has depreciated the quality of the cinders, so far as their use for ballast is concerned, for most of them have no life in them. Yet they are still used in large volume for sidings and branch lines, where they perform a useful function.

There are miles of embankment that, while not subject to wash, is subject to the slow erosion that afflicts all soil, so that the shoulders of the roadbed are constantly rounding off and becoming narrower and uneven. Cinders are particularly useful on such shoulders, for the roadbed can be built out to its original width with porous material that does not interfere with drainage; in fact, a roadbed with a cinder shoulder is generally dryer than one without the cinders. For these reasons, supervisors and roadmasters would have used more cinders for this purpose if they had been available. I recommend using in this way all cinders not required for ballasting branch lines and sidings.

Cinders used for strengthening the shoulder of the roadbed not only tend to keep the roadbed dry but they support the ballast at the toe line and thus preserve the shoulder of the ballast, which, in turn, acts to hold the track in line on both curves and tangents. Because of their porosity, they allow quick disposal of the surface water that falls on the roadbed. At the same time, because the water seeps through them, they prevent erosion. A rather heavy facing of cinders on shoulders and slopes where weeds are difficult to control, will tend to prevent growth of vegetation and add another advantage to their use.

Where cinders are used to strengthen the shoulder of the embankment, it is a wise precaution to cut the shoulder down about six inches, or, in some instances, as much as a foot, keeping as close to the toe of the ballast as is advisable. A spreader should be used for cutting down the shoulder. Where this is done, the cinders should be unloaded immediately and the shoulder should be built out somewhat wider than standard and brought slightly above the foot of the ballast. This will insure good drainage, better support for the ballast and the elimination of weeds on the shoulder of the roadbed. Used in this way, the cost of unloading and dressing will be repaid many times over in reduced maintenance expenses.

Is Fireproofing Practical?

Is the fireproofing of building lumber practical? What are the advantages? The disadvantages? Will it interfere with the preservative treatment of the lumber? With painting the building?

Flameproofing Only

By General Inspector of Buildings

Three different terms are in more or less general use to designate the treatment of lumber to render it immune or partially immune to fire, namely, fireproofing, flameproofing and fire resisting. Personally, I prefer either the second or the third term as more descriptive of the protection afforded by the treatment of the wood. Fire-prevention engineers prefer the third term, because even buildings constructed of incombustible materials may be damaged or destroyed by a fire, if it is of sufficient intensity.

The chemicals used in the treatment are referred to as fire retardants. The resistance of the lumber to fire after treatment, will depend in large measure upon the amount of the chemicals forced into the wood. In this connection, Navy department specification 51C40 lists four formulas for fireproofing wood, which incorporates six different chemicals that may be used either alone or in combinations that are specified.

It is entirely practical to treat building lumber to make it fire resistant. Perhaps the best and most notable example of the practicability of the practice are the wood hangars built recently by the Navy to house the blimps which it possesses. These hangars, which are the largest wooden buildings ever constructed, are 1,060 ft. long, 297 ft. wide and 171 ft. high from floor to roof, and only wood, treated to render it flameproof, entered into the construction. Obviously, the advantage of treating building lumber in this manner is to reduce the fire hazard in the structure in which it is used.

There are few disadvantages in the fire-resistant treatment of building lumber other than the increased cost which the treatment entails. The chemicals used as fire retardants in impregnating the wood tend to corrode metal fastenings. However, the degree to which this action occurs will depend very largely on the extent to which the wood is exposed to or absorbs moisture. For this reason, the least corrosion will occur under the driest conditions, which are usually inside the building.

Impregnation of the wood with fire-retardant chemicals may have some effect upon the strength of the timber. In this connection the Navy specification, 51C40, which has been mentioned, cautions that "High retentions of some chemicals may have an adverse effect on the strength of the timber."

The treatment of lumber with fire retardant chemicals will not interfere with certain forms of preservative treatment; in fact, zinc chloride, chromated zinc chloride, borax and boric acid, which are used extensively as fire retardants, protect against

both fire and decay. Fire retardants cannot be used with creosote. While creosoted wood is highly inflammable immediately after treatment, it seems to build up a certain fire resistance as it seasons, according to Dr. Herman von Schrenk, in the National Fire Protection Association Quarterly, April 1918, in which he states that "It appears that creosoted timbers, when freshly treated, are highly inflammable, owing to the giving off of highly inflammable gases. As the creosoted timber ages, there is a marked reduction in the inflammability, until after five or six months it will have the same degree of inflammability as untreated timber, and from then on becomes less inflammable." Arthur M. Shaw, in the proceedings of the Louisiana Engineering Society, October, 1922, states that "Creosote treatment, if followed by a few months of seasoning, increases the ability of wooden members to resist ignition and materially retards burning after ignition."

Fire-retardant chemicals may interfere with the paint film if there is leaching, causing heavy deposits on the surface of the wood. All such deposits should be removed before the paint is applied. For best results, special paints should be used.

Can Be Painted

By L. C. Winkelhaus
Architectual Engineer, Chicago & North Western, Chicago

There is no question but that wood can be so treated that it will not support combustion; in fact, several large cities provide in their building codes for fire-retardant treatment of structural timbers. The fire-proofing of wood has been under investigation by the American Wood-Preservers' Association for several years, and much information has been obtained from European engineers, where the study is much more advanced than it is here.

There are a number of salt treatments which will make wood fire resistant and at the same time provide protection from attack by termites and fungi. The chemical use and the depth of penetration will determine the permanence of the protection. Salt-treated woods can be painted.

Depth of Ballast on Trestles

Where the track is being given a general raise, should the depth of the ballast be increased across ballast-deck trestles? Why? If not, how can it be avoided? How will train movements be affected?

Should Not Be Done

By R. P. Hart
Bridge Engineer, Missouri Pacific, St. Louis, Mo.

There are several reasons why it is not desirable to increase, to any extent at least, the depth of ballast on creosoted-timber ballast-deck trestles. In the first place, this results in an increase in the dead load, amounting to approximately 500 lb. per foot of track for each 6-in. raise, and is objectionable from the standpoint of loading where operated live load results in stresses approaching the limit for the grade of timber used in the bridge deck.

Again, the matter of providing higher ballast retainers is involved, to prevent the increased ballast from being wasted over the side of the bridge, and to avoid losing support for the track ties. If higher ballast retainers are used to retain the ballast, it will be necessary to restrain them by means of straps anchored to the floor plank to keep them from overturning gradually and resulting in loss of lateral support for the track.

The foregoing comments are based upon the assumption that before being raised, the track on the bridge has been supported on sufficient ballast to provide a satisfactory surface condition. I believe it will be found generally that seven or eight inches of ballast under the ties is desirable to permit the track to be worked satisfactorily and to maintain a satisfactory surface. More than eight inches of ballast does not seem necessary or desirable. As I view the subject, the best way to avoid an excessive depth of ballast on such trestles is to install subcaps of the required depth on the bents and maintain the floor of the bridge at a fixed distance below the base of rail—preferably the depth of the tie plus 8 in. This method is preferable where the track across the bridge is lower than the adjacent track and it is desirable or necessary to eliminate a sag in the track at the bridge.

Other methods of avoiding excessive ballast on such trestles will depend in large measure upon the profile of the track at the particular location. If the grade of the track is downward each way from the bridge, it will not be difficult to remove sufficient ballast each side of the bridge to permit the application of such additional new ballast as may be required and maintain the elevation on the bridge itself. Obviously, this can be done in any case, but it might be objectionable if the grade of the track ascends from the bridge, so that a large amount of work would be involved in removing the old ballast before making the general application of fresh ballast.

In general, I prefer to make any appreciable raise, say, more than 2 in., on ballast-deck trestles by installing subcaps on the bents, for this will result in the least interference with train movements. When traffic is heavy, and the raise is 6 in. or more, it will be necessary to raise the deck of the bridge on thin temporary subcaps, a few panels at a time, and then later replace the temporary shims with suitable creosoted timber subcaps of the correct thickness.

Can Easily Overload

By General Inspector of Bridges

This is a matter of importance which is sometimes overlooked in the rush to get a ballasting program completed. It should be borne constantly in mind by both the bridge forces and the track forces that a ballast-deck bridge can often be overloaded by increasing the depth of ballast, to such an extent that the stringers will be overstressed and even the piles loaded beyond their bearing power. When a bridge is designed, it is designed for a definite loading, and no change in either the dead or live load should be made without submitting the matter to the engineer of bridges for checking. This cannot be done by the local forces, for they do not have the basic data upon which to base an analysis.

In a case that came to light recently, local division forces carried out a ballasting program that called for a 12-in. raise at a ballast deck bridge. This raise was decided on partly to ease out a sag at the bridge. This deck already carried about 15 in. of ballast, and the additional load was sufficient to overstress the stringers to such an extent that an emergency crib support between bents became necessary. As a remedy, the bridge was raised 16 in. on additional caps, which were well braced to insure against turning over, and 16 in. of

ballast was dug out, leaving a bed 11 in. deep, which was ample for the track support. Obviously, this is the action that should have been taken in the first place. No purpose is served by placing a deep bed of ballast on the floor of a ballast deck bridge; and I would limit the ballast to 12 in.

Extending the Life of Rail

In what ways and to what extent can the service life of rail be extended through good maintenance? Who should be responsible?

Loose Bolts a Major Cause

By W. Woolsey
Section Foreman, Illinois Central, Chicago

An essential requirement for prolonging the life of rail is immediate surfacing after it is laid. If this is not done, damage can occur that can never be repaired. When a rail develops a surface kink, that rail is spoiled. There are methods for taking out surface kinks, but the results are only temporary, and they tend to return, for the metal was overstressed when the kink was formed and must be overstressed again to take it out.

After the rail has been surfaced, the responsibility for its maintenance falls on the section foreman, this being directly in line with his duties. Loose bolts are a major cause of damage and of the shortening of the life of rail. Worn or decayed ties, particularly at the joints, also cause much damage if they are not replaced. Poorly spaced joint ties and poorly drained joints are also major causes of rail damage which can be corrected by the section forces. Uneven tie spacing may be as detrimental as decayed ties.

Rail that is laid carefully and cared for immediately, and then maintained in such manner that the defects which have been mentioned are corrected promptly, will give long service. Rail that is not cared for when laid will need renewal after a much shorter period of service, no matter how much effort is expended on maintenance.

Do a Good Job Initially

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

In the first place, when the rail is laid the ballast should be clean, or cleaned if dirty, and the track should be given a general raise, replacing liberally all ties that need renewal so that minimum disturbance to the track will be necessary later. The ties should be spaced evenly and the rail gaged correctly, and lined. The expansion allowance should be uniform and anti-creepers should be applied immediately after the spiking is completed. These items are given emphasis, because, unless they are given careful attention, no amount of later maintenance will overcome the handicap of a poor initial job when the rail is installed. Much of the rail damage that appears at a later date has its inception in careless or indifferent work at the time it was laid.

Driver burns should be welded, for no maintenance force can keep track in surface where the rail is roughened by driver burns. Bolts must be kept tight and oiled so that the nuts can be turned freely. Loose bolts add to the wear on the fishing surfaces and ruin the rail ends. Irregular surface, line and gage should be corrected as soon as the irregularities appear.

Oversized or reformed bars should be applied when the fishing surfaces become worn, and the rail ends should be reconditioned by welding when battered. Rail on curves should be transposed before excessive wear occurs. If these items are given prompt attention, the service life of the rail will be prolonged. It is important, however, that the attention be prompt, for delayed action in correcting these conditions damages rail.

Making Floors Last Longer

What measures should be taken when installing a wood-block floor, that will prolong its life? Why? How should the joints be treated? Does the service to which it is subjected make any difference?

Lay on Smooth Base

By O. G. Wilbur
Appraisal Engineer, Baltimore & Ohio, Baltimore, Md.

A wood-block floor should be laid on a foundation of only sufficient strength to carry the loading to be encountered; it should preferably be of concrete, and which should be finished to a smooth even surface. The blocks should be well manufactured, free from defects that will impair their usefulness in the floor. Douglas fir or southern yellow pine blocks should contain not less than six annual rings, measured radially, in the one-inch space which begins two inches from the pith of the block. If the block does not contain the pith, the one-inch width to be used should begin one inch away from the ring nearest the heart of the block. Blocks containing five or six rings in this inch are acceptable if they contain 33⅓ per cent or more of summer wood.

The floor should be laid under the direct supervision of the manufacturer, by the bituminous paint-coat method, by the mortar-bed method or by the bituminous, mastic-cushion method, as prescribed by the American Wood-Preservers Association. Under dry-floor conditions, the blocks should be driven as tightly together as possible in both directions before the floor is tamped or rolled to a smooth, level surface. Under wet-floor or humid conditions, the blocks should not be driven together tightly.

Bituminous expansion joints one inch in width should be formed against all walls and around all columns and other obstructions. After the blocks have been tamped or rolled, the expansion joints and the joints between the blocks should be filled to within an inch of the top with a bituminous filler. The filler, heated to the highest possible temperature without burning, should then be applied without being allowed to cool, by flushing it over the surface of the floor, and worked into all of the joints by means of a rubber-edged squeegee.

With the joints filled uniformly, the floor should be covered with fine, sharp sand which should be permitted to remain under traffic for a week or ten days.

The blocks must be set with the grain vertical, in straight parallel courses, with the long dimension at right angles to the direction of traffic. Blocks less than three inches deep, parallel to the fibre, should not be used. A wood-block floor correctly laid is an all-round serviceable floor.

Never Bed in Sand

By L. G. Byrd
Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Satisfactory service cannot be expected from a wood-block floor unless it is laid on a satisfactory foundation, so that this becomes the first and most important factor in its installation. Regardless of their size or of the service they are to perform, wood blocks should be laid on a concrete base, reinforced if the soil is soft, but with sufficient thickness to prevent moisture from reaching the blocks, for water is one of the enemies of wood-block floors. In buildings where heavy machinery or other heavy loads are handled, the concrete sub-floor should be of sufficient thickness to withstand the shocks of rough service.

Wood blocks range from two to three inches in thickness and are laid with the grain vertical, usually in beds of pitch or asphalt. The asphalt or pitch coating serves not only as a binder but as waterproofing for the base. Wood-block flooring should never be laid on a sand bed, for the sand will retain any moisture or water that may reach it and swell the blocks, soften the fibre and generally cause the blocks to deteriorate. The joints are often filled with hot asphalt or pitch which, in some cases contains sand or binding materials.

Care should be exercised in selecting the timber from which the blocks are made, as well as the manner of their treatment, to prevent swelling and consequent buckling of the floor. The joint filler should have a sufficiently low melting point to insure that it will run into the joints, but it should be stiff enough at ordinary temperatures to insure that it will not work down under the blocks and cause irregularities in the surface.

Wood block floors are often installed on transfer platforms, where the service is extremely heavy, in storehouses and in shops, where they sometimes receive rather rough usage, and in other places where heavy machinery is handled. To obtain full service life from such floors, the sub-floor should be well drained; the blocks should be laid inside the base away from the edge of the building to insure that no water will work its way beneath the blocks. These floors require the same attention as other floors that are subject to heavy traffic or where employees work over the floor. They must be kept clean and free from bolt heads, hot rivets and other bodies that might be pressed into the fibres and cause the blocks to split and end their usefulness.

How Many Ties Per Man?

When tie renewals are less than 100 to the mile, what is a reasonable output per man when renewing ties in main tracks? What effects do the density of traffic and the kind of ballast have?

Checked 2,000,000 Ties

By C. D. Turley
Chief Tie Inspector, Illinois Central, Chicago

A combination of the group and spot-in methods of tie renewals will result in more uniform track and in a longer service life for ties than strict adherence to either plan. A yearly renewal plan is also desirable, because it insures a higher standard of tie maintenance, keeps the general tie condition more uniform, permits the ultimate life to be obtained from each tie, provides better track support and, as a result, out-of-face surfacing will be required at less frequent intervals. Obviously, it costs less to renew ties when track is being surfaced out of face and for this reason the group-renewal plan of replacing all ties that do not have two or more years of service life remaining should be followed.

In checking the installation of more than 2,000,000 ties, we found that ties were spotted in rock and cementing gravel ballast at the rate of 1.17 ties per man-hour; in bank-run and washed gravel, or cinders, at the rate of 1.40 ties per man-hour; and, where the track was being raised out of face, the rate was 1.77 ties per man-hour, regardless of the type of ballast. In analyzing the details of this record, we found that factors other than the kind of ballast affected the output materially, such as the amount of traffic; the temperature, that is, whether hot or cold; the season of the year, that is, whether the roadbed was dry and hard or moist and soft. In terminals where traffic is dense and on heavy-traffic lines away from terminals, the output was reduced as much as 10 to 12 per cent. Extremely warm weather, especially for long periods, reduced the output per man-hour about 10 per cent, compared with more favorable temperatures.

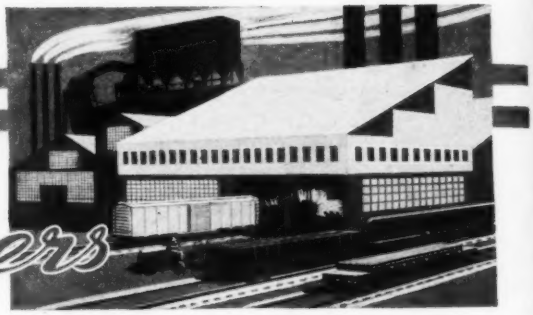
Many Factors Involved

By District Engineer

This is a question that cannot be answered categorically, for there are too many factors involved to permit specific statements as to the output. Obviously, only the spot method of renewal is possible when less than 100 ties are to be inserted in any mile, for this is only two ties to three rail lengths. This means that the gang must do a considerable amount of walking to complete the renewals, and that as the number of ties to be inserted decreases, the amount of walking required for each tie will increase, and more unproductive time will be consumed. The amount of surfacing and lining that must be done in connection with the renewals will also affect the output in terms of ties.

Again, if the work is done in the spring when the ballast is loose and the temperature is moderate, more work can be done than later in the year when the weather is hot and the ballast is packed. The kind of ballast has a strong influence on the output, for 50 per cent more work can be done in cinders or loose gravel than in stone ballast; and many more ties can be inserted per man-hour in light-traffic branch-line tracks than in heavy-traffic main-line tracks.

PRODUCTS of Manufacturers

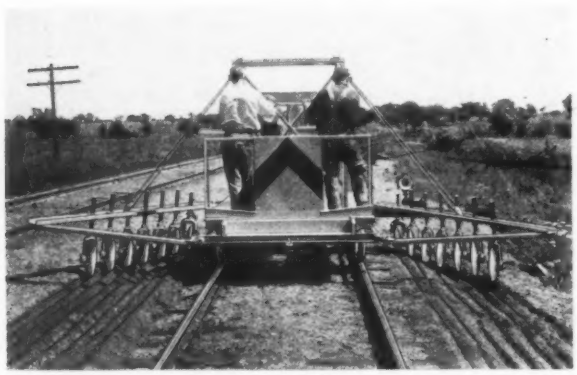


New Flooring Material

The Flexrock Company, Philadelphia, Pa., has introduced a new floor product which is said to be highly resistant to the effects of acid, water, oil and grease. Taking its name from the first letters of these four words, the new material is called Awog. In addition to its imperviousness, this material is said to present new attainments in durability, and it is claimed that it is smooth and dustless, that it facilitates cleaning and sanitation, and that it will withstand the heaviest traffic. The new product is recommended for use in constructing new floors, in placing overlays on concrete, brick, stone or wood, and for repairing and resurfacing areas of any size.

Kalamazoo Discer Car

A NEW model power discer car has been developed by the Kalamazoo Railway Supply Company, Kalamazoo, Mich. This model is built on the general lines of the Model 38D power discer, but features several changes, most important of which are the mounting of the discing equipment on a No. 38A-6 car equipped with two-inch diameter axles, final drive by all four wheels, and a large heavy-duty six-cylinder, 60-hp. International Harvester engine. This latter unit provides ample power for operating the discing equipment, which consists of seven discs mounted on each arm. The discing attachments are easily removed, permitting the unit to be used as a heavy-duty motor car when necessary.



The New Kalamazoo Discer Car Has a 60-hp. International Harvester Engine

The car has an overall length of 128 in. and a width of 85 in. It has a seat 30 in. wide and 113 in. long and tool trays 10¼ in. wide, 8 in. deep and 9 ft. 3 in. long. It weighs 3730 lb. and has a frame of steel channels and angles, bolted or welded at the joints. Transmission of power from the motor to the wheels is by means of a selective gear transmission and chain drive to all four wheels, with three speeds forward and one speed in reverse and also a reverse gear transmission, providing three speeds in either direction. The car is equipped with four-wheel toggle brakes with replaceable cast iron shoes, 16-in. cold-formed steel wheels, Timken axle bearings, safety rails and a drawhead welded on both front and rear.

The discs are mounted on rigidly-supported arms that can be raised or lowered by hand crank or crank wheel and each disc can be adjusted for height or angle. The discs are 16 in. in diameter and are made of special wear-resisting steel. They revolve on Timken tapered roller bearings which are protected with dirt-proof oil seals.

New Model Two- to Four-Man Inspection Car

THE Buda Company, Harvey, Ill., has modified the design of its Roadmaster two- to four-man inspection car, which new design is designated as the F-2, Model B. The new car is equipped with special ball-bearing

The New F-2, Model B, "Roadmaster" Has Spring-Mounted Pedestal Type Bearings

spring-mounted pedestal bearings, which with deep well-cushioned seats, absorb road shock, thereby reducing fatigue of the operator.

The Model B Roadmaster has a length of 80 in., a width of 63½ in., a height of 38 in. and a wheel base of 37 in. It weighs 760 lb. and has a lift at the rear handles of 95 lb. It is powered with a 7.7 hp. air-cooled Briggs & Stratton, Model ZZP, 4-cycle engine. A cone-type friction drive and a chain transmit the power to the rear axle. The car also has a welded steel frame, safety hand rails, rail skids and four-wheel adjustable, self-centering brakes with replaceable metal liners.

The New Small Tournapull Unit Is Designed for Fast, One-Man Wartime Operation

New Model D Tournapull

A SMALL but powerful new Tournapull unit, the Model D, has been developed by R. G. LeTourneau, Inc., Peoria, Ill., to add to its line of Tournapulls and grading equipment. The Model D Tournapull is a smaller, lighter model, specifically designed as a unit for quick, one-man wartime operation which can be air-borne and even crash landed for use on the fighting fronts. The unit, with proper accessories, is equally adaptable for peace-time use after the war, for digging, pushing, pulling, lifting, or other operations.

The Model D has large pneumatic rubber tires which give it ample flotation on soft surfaces and enable it to carry heavy loads over concrete roads. It possesses various speeds up to 18.8 m.p.h. and, equipped with a two-yard Carryall scraper and tiltdozer, weighs only 3¼ tons. The unit is easily convertible and can also be attached to a flat-bed trailer capable of trucking a 7,000-lb. tractor or to a LeTourneau crane, capable of lifts up to 4,000 lb. A rooter tooth can be attached to the scraper to rip through baked earth or similar hard surfaces.

New Screw Spike Driver

A NEW screw spike driver, known as size 55L, has been developed by the Ingersoll-Rand Company, Phillipsburg, N. J. Powered by a reversible Multi-Vane air motor, the new unit was introduced to replace a piston-type machine formerly manufactured by this company. It is said to be smoother in operation and faster than the former piston-type model.

A two-man machine, it is said that the size 55L unit will put down screw spikes quickly and tightly at a large saving as compared with hand methods. It may be had with either a straight or a Y-type "dead" handle, and, with standard equipment, it weighs 76 lb. It has an average working speed of 170 revolutions per minute when operated at a pressure of 90 lb. per sq. in.

Driving Screw Spikes with an Ingersoll-Rand Size 55L Machine

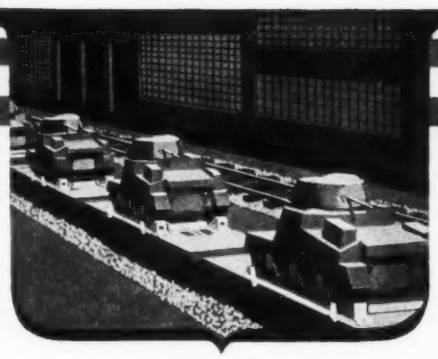
Worthington Tie Tamper

THE Worthington Pump & Machinery Corporation, Holyoke Compressor & Air Tool Department, Holyoke, Mass., is offering to the railroads a new tie tamping tool, known as Model WTT-7. This is a pneumatic tool of the percussion type, in which a reciprocating piston delivers a succession of blows to the shank end of the tamping bar. While the air consumption of the tool varies with the pressure used, it is said to be such that four of them can be operated from a compressor having a capacity of 60 cu. ft. per min., and still leave some reserve capacity. It is said that the tool embodies an improved design which reduces the danger of freezing in cold weather, and has a new type throttle that eliminates leakage.

The Worthington WTT-7 Tie Tamping Tool

Some of the specifications of the new tamper are as follows: Cylinder bore, 1 11/16 in.; weight with tamping bar, 42 lb.; weight without tamping bar, 35½ lb.; length with tamping bar, 43 in.; and length without tamping bar, 28 in. The shank is hexagonal and the standard shank size is ⅞ in. by 2 9/16 in. It is recommended that the new tool be used with an air pressure of 70 lb. to 100 lb. per sq. in.

NEWS of the Month



Fire Damages 23 Engines at Bellefontaine

Twenty-three locomotives were damaged in the destruction of a 30-stall engine house of the New York Central on Sept. 4, by a fire which is believed to have started from a spark from a welding torch at Bellefontaine, Ohio. The buildings, which included a machine shop and a storehouse, were of frame construction.

Russia Gets Lend-Lease Rails and Signal Equipment

Up to July 31, Russia had received "more than 100,000 tons of rails and accessories" through lend-lease operations, while "quantities of automatic block signal system equipment" for that country "are in production," according to President Roosevelt's lend-lease report submitted to Congress last month. Other shipments to Russia have included "more than 150,000 motor vehicles."

McNutt Would Continue School Boys on Part-Time Work

Paul V. McNutt, chairman of the War Manpower Commission, has asked employers, school officials, civic leaders and parents of the nation to aid in formulating a program whereby high school students who have been employed during vacation months can continue such employment with industries on a part-time basis while attending school. Mr. McNutt points out that such a plan would permit student manpower to continue to be used in the country's interest while following their educational opportunities.

WPB Issues Instructions for Rail and Accessories

Explicit instructions governing the authorization for rail and track accessories and the placing of authorized controlled materials orders therefor during 1944, are contained in a letter dated September 5, from G. M. Cornell, deputy director, Transportation Equipment Division, War Production Board, and addressed to all railroad and transit operators under Order P-142.

The letter also calls attention to avoidable delays in placing authorized controlled materials orders and points out that if, in the future, orders for rail are not validated within seven days after the railway receives its designated allotment form CMPL-114, the penalty may involve the opening of the rail schedule for other orders. The letter (WPBI-820) reads as follows:

"Please refer to Mr. Stevenson's letter dated June 1, 1943, Form WPB-2585, Supplement 1, concerning authorization for rail and track accessories.

"Authorizations for rail and track accessories and the placing of authorized controlled materials orders for these items will be handled during 1944 in the manner outlined in the above letter. One Form WPB-2585 will be issued each quarter covering the new rail allotment and the track accessories to accompany such new rail and another Form WPB-2585 will be issued for other maintenance accessories required.

"Our attention has been called to the fact that some railroad operators are waiting until they receive copy of Form CMPL-114 before making their orders for new rail accessories 'authorized controlled materials orders.' This is contrary to instructions in letter Form WPB-2585, Supplement 1 and may result in failure to receive accessories as a result of mill capacity not being available for late orders.

"Some roads are apparently taking too much time to make their rail orders 'authorized controlled materials orders' and it is therefore necessary to advise that hereafter, if an order for rail is not validated within seven days of receipt by the railroad of designated allotment Form CMPL-114, the rail schedule may be opened for other orders.

"Any questions concerning these instructions should be referred to the Transportation Equipment Division, War Production Board, Washington, D. C."

Tunnel Fire Ties Up Moffat Line and Rio Grande

A destructive fire in the timber lining of Tunnel No. 10 of the Denver & Salt Lake on September 20 has closed the line of this road and also the "Moffat Tunnel route" of the Denver & Rio Grande Western. Trains are being routed over the main line of the Rio Grande via Pueblo and the Royal Gorge.

The fire, presumably set by a hot locomotive spark, broke out on September 20 and had gained considerable headway before it was discovered. Three Denver firemen lost their lives in their efforts to extinguish the blaze. Handicapped by debris which filled part of the tunnel when the timber lining burned away, fire fighters fought the fire for four days before reconstruction could be started. The tunnel, which is 1,570 ft. long and is located about 27 miles northwest of Denver, Colo., had 1,129 ft. of timber lining. It is located at a point inaccessible to highways, and water for fighting the blaze was hauled from Denver in tank cars. No estimate is available as to when the tunnel will again be open for traffic.

Yanks Operate Trains Four Hours After Landing

Four hours after they had landed behind an assault wave at Licata in Sicily, the U. S. Army's 727th Railway Operating Battalion had steam up in a captured locomotive. For this achievement, the 727th has been commended by a citation from General George S. Patton, Jr., for exceptional speed and efficiency under fire. In his commendation to Brigadier-General Carl S. Gray, Jr., director general of the military railway service, General Patton said in part: "Opening of rail lines and organization of Italian railroad personnel were made so rapidly that rail service was immediately available in the port of Palermo when it opened on July 28 and service was maintained from that port in spite of bombing attacks and sabotage."

Discuss Labor Shortage

Details of the acute labor shortage, and ways of relieving that situation were discussed in Chicago on September 15 when Joseph B. Eastman, director of the Office of Defense Transportation, was the principal speaker at a meeting held in the Palmer House in that city. Those present with Mr. Eastman were J. J. Pelley, president of the Association of American Railroads; Otto S. Beyer, director of transport personnel of the O.D.T., and representatives of individual railroads.

The labor situation is especially critical in the West and along the Pacific Coast where war plants paying high wages have attracted railroad workers, and becomes more acute as war activity in the Pacific is extended, according to Mr. Eastman. Among suggestions presented for easing the shortage were: more consideration for railroad needs by draft boards, the importation of more Mexicans for track maintenance work, and the use of war prisoners.

Association News

Maintenance of Way Club of Chicago

The first fall meeting of the club will be held on Monday, October 25, in the Ambassador Room of Huyler's Restaurant in the Straus Building, 310 S. Michigan Avenue, Chicago. Dinner will be served at 6:30 p.m. and will be followed by a program which promises to be of unusually timely interest. Work on the annual Year Book of the club is nearing completion and it will be mailed to members soon.

Metropolitan Maintenance of Way Club

The season's activities will be inaugurated with a dinner meeting at the Governor Clinton hotel, New York, on Friday, October 29. The principal feature of the meeting will be the showing of a film that has been produced by the New York Central as an aid in educating its employees in the proper methods of laying rail. Entitled Seeing Is Believing, the film is accompanied by a synchronized running commentary in the form of a recording. The showing will be preceded by introductory remarks by C. B. Bronson, inspecting engineer of the New York Central.

Railway Tie Association

Preparatory to the twenty-eighth annual meeting which will be held at the Netherland Plaza hotel, Cincinnati, Ohio, on May 16-17, 1944, committees have been appointed as follows: Checking and Splitting Ties, T. H. Patrick, Chicago, Milwaukee, St. Paul & Pacific, Chicago, chairman; Government Regulation, T. J. Turley, Jr., Bond Brothers, Inc., Louisville, Ky., chairman; Legislation, B. N. Johnson, Wood Preserving Division, Koppers Co., Richmond, Ind., chairman; Manufacturing Practice, Meyer Levy, T. J. Moss Tie Co., St. Louis, Mo., chairman; Mechanical Equipment, W. D. Humphrey, Wood Preserving Division, Koppers Co., Memphis, Tenn., chairman; Moisture Gradient, W. P. Arnold, Wood Preserving Division, Koppers Co., Orrville, Ohio, chairman; Specifications and Inspection, D. C. Jones, Wood Preserving Division, Koppers Co., Chicago, chairman; Timber Conservation, R. H. White, Jr., Southern Wood Preserving Co., Atlanta, Ga., chairman.

Bridge and Building Association

Recognizing the acute need of members for information that will help them meet the abnormal demands that are being made on the facilities under their supervision, the officers of the American Railway Bridge and Building Association have decided that it is in the interest of these members and of the railways with which they are connected to hold a two-day War Time Conference at the Hotel Sherman, Chicago, on October 20-21, in lieu of the usual three-day meeting. This decision was reached after consultation with officers of the O.D.T., the A.A.R. and individual railways, and the program will be given over largely to addresses by officers of these groups on the problems confronting this branch of railway service, today and tomorrow. Committee reports will be briefed in presentation to give a maximum amount of time for addresses.

The Conference will convene at 9:30 Wednesday forenoon and will adjourn about 4 o'clock Thursday afternoon. The session on Wednesday afternoon will be given over to the consideration of labor supply and that on Thursday forenoon to materials, each with addresses on present conditions and on the outlook nationwide, supplemented by reports on specific measures developed on individual roads.

American Railway Engineering Association

Five standing committees of the association held meetings during September, and at least three committees plan meetings during October, two concurrent with the two-day war-time conference of the American Railway Bridge and Building Association in Chicago on October 20 and 21, to afford their members opportunity to attend sessions of the Bridge and Building meeting. The committees with definite plans for meetings in October are: Masonry, at Chicago, on October 6 and 7; Water Service, Fire Protection and Sanitation, at Chicago, on October 20; and Rail, at Chicago, on October 20. In addition, the committees on Wood Bridges and Trestles and Records and Accounts are also considering meetings in October.

The September-October bulletin of the association, No. 440, will be mailed to members during the month. This bulletin, among other things, will contain reports on the current status of the investigation of the relation between track and equipment, being carried out by a joint committee of the Mechanical and Engineering divisions of the A.A.R., as follows: Comments on the counterbalance investigation; a report by G. M. Magee and E. E. Cress, research engineer and assistant engineer tests, respectively, of the Engineering division, in connection with the Flat Spot investigation; and a report on the relation of wheel loads to wheel diameter, by N. J. Alleman, special research assistant professor of engineering materials, University of Illinois. The bulletin will also include a monograph on Fatigue Failure in Relation to the Strengthening and Repair of Steel Bridge Members, by W. M. Wilson, research professor of structural engineering, University of Illinois; and a preliminary report on the investigation of electrolysis, being conducted by the Engineering division for the Electrical section of the Association of American Railroads.

Five standing committees held meetings during September, as follows: Maintenance of Way Work Equipment, at Chicago, on September 13 and 14; Track, at Chicago, on September 16; Iron and Steel Structures, at Pittsburgh, Pa., on September 20 and 21; Economics of Railway Location and Operation, at Cleveland, Ohio, on September 21 and 22; Yards and Terminals, at Cleveland, Ohio, September 29; and Roadway, at Chicago, on Sept. 29 and 30.

Personal Mention

General

Leon V. Lienhard, trainmaster on the Atchison, Topeka & Santa Fe at Arkansas City, Kan., and an engineer by training, has been promoted to superintendent of the Southern Kansas division, with headquarters at Chanute, Kan.

Engineering

L. E. Peyser, assistant architect of the Southern Pacific, has been advanced to principal assistant architect, with headquarters as before at San Francisco, Cal.

L. R. Morgan, a transitman on the New York Central at Syracuse, N.Y., has been appointed fire prevention engineer of the Michigan Central, with headquarters at Detroit, Mich.

N. A. Richards, acting assistant division engineer on the Atchison, Topeka & Santa Fe at San Bernardino, Cal., has been promoted to assistant division engineer, with headquarters at San Diego, Cal.

W. N. Rice, track supervisor of the Illinois Central, has been promoted to assistant engineer of the Iowa division west of Waterloo, Iowa, with headquarters as before at Waterloo. **J. H. Davis,** formerly assistant engineer of the entire Iowa division, continues as assistant engineer of the division east of Waterloo.

J. A. Holbrook, an engineering draftsman in the office of the mechanical engineer in the engineering department of the New York Central, Lines Buffalo and East, with headquarters at New York, has been promoted to mechanical engineer on the staff of the engineer maintenance of way of the Lines Buffalo and East, with the same headquarters, to succeed **W. L. Curtiss,** who has retired.

B. M. Murdoch, assistant engineer of buildings at the Illinois Central, has been promoted to engineer of buildings, with headquarters as before at Chicago, relieving **Frank R. Judd,** whose retirement on September 1 because of ill health was reported in the September issue. **J. B. Schaub,** chief draftsman, has been advanced to assistant engineer of buildings, succeeding Mr. Murdoch.

William R. Rees, division engineer on the Atchison, Topeka & Santa Fe at Emporia, Kan., has been promoted to district engineer of the Northern district, with headquarters at La Junta, Colo., succeeding **J. W. Walter,** who has been transferred to the Southern district, with headquarters at Amarillo, Tex., replacing **J. A. Noble,** whose promotion to chief engineer of the Western lines is reported elsewhere in this issue.

G. E. Stewart, assistant division engineer on the Sacramento division of the Southern Pacific at Sacramento, Cal., has been transferred to the Portland division at Portland, Ore., succeeding **Gage Haselton,** whose promotion to division engineer

was reported in the August issue. **F. M. Lathrop,** assistant engineer on the Western division, has been appointed second assistant division engineer at Portland, relieving **H. M. Williamson,** who has been commissioned an officer in the U. S. Navy.

A. J. Flannagen, assistant division engineer of the Eastern division of the New York Central, with headquarters at New York, has been promoted to assistant engineer in the office of the engineer maintenance-of-way system, with the same headquarters. **John V. Middleton,** assistant supervisor of track on the Buffalo division, with headquarters at Lackawanna, N.Y., has been appointed assistant division engineer of the Eastern division at New York, to succeed Mr. Flannagen.

T. Fred Burris has been appointed division engineer of the Chicago-Petoskey division of the Pere Marquette, with headquarters at Grand Rapids, Mich., succeeding **Frank Manning,** who has retired after more than 40 years service.

M. B. Davis, whose promotion to division engineer on the Illinois Central, with headquarters at Waterloo, Iowa, was reported in the September issue of *Railway Engineering and Maintenance,* was born at Winchester, Ind., on October 11, 1888, and graduated in civil engineering from Purdue University in 1912. He entered railway service in June, 1912, as a chain-

M. B. Davis

man on the I.C. at Batesville, Miss., subsequently serving in that capacity on the Springfield, Memphis, and Indiana divisions. In 1917 he was advanced to assistant engineer on maintenance and construction and in the same year was granted a leave of absence to serve with the American Expeditionary Force during World War I. In 1919 Mr. Davis returned to the Illinois Central as an assistant engineer in the maintenance of way department, with headquarters at Chicago, and a short time later he was transferred to Carbondale, Ill. In 1924 he was appointed track supervisor at Mattoon, Ill. Later he was transferred to Kankakee, Ill., remaining at that location until his new promotion, effective September 1.

Lee A. Loggins, whose promotion to division engineer on the Southern Pacific Lines in Texas and Louisiana, with headquarters at Victoria, Tex., was reported in the September issue, was born at Ennis, Tex., on June 28, 1902, and graduated in railroad construction engineering from the University of Texas in 1937. He entered railroad service with the Southern Pacific

Lee A. Loggins

Lines in Texas and Louisiana in 1920 as a coppersmith helper at Ennis, subsequently serving as utility clerk, rodman, chainman, instrumentman and engineer accountant at various points on the road until 1936 when he was granted a leave of absence to complete work for his degree at the University of Texas. In July, 1937, Mr. Loggins returned to the railroad as an instrumentman on the Victoria division, with headquarters at Victoria, Tex., and in August, 1939, he was promoted to assistant engineer, with the same headquarters. In June, 1942, he was appointed assistant engineer bridges and buildings, with headquarters at Houston, holding that position until his new promotion, effective August 16.

W. O. Cudworth, whose appointment as engineer maintenance of way of the Eastern lines of the Canadian Pacific at Toronto, Ont., was reported in the September issue of *Railway Engineering and Maintenance,* has served the Eastern lines of the Canadian Pacific for the past 33 years. Mr. Cudworth entered Canadian Pacific service as a chainman in the construction department. Subsequently he became resident engineer at North Bay, Ont., and division engineer at Sudbury, Ont., successively. Mr. Cudworth became assistant engineer maintenance of way, with headquarters at Montreal, Que., on January 1, 1926, and on May 1, 1937, was transferred to Toronto, remaining in the latter position until his recent appointment as engineer, maintenance of way.

Charles McDiarmid, whose appointment as chief engineer of the Georgia & Florida, with headquarters at Augusta, Ga., was reported in the September issue, was born on August 10, 1905, at Fayetteville, N.C., and attended Johns Hopkins University, Baltimore, Md. Mr. McDiarmid entered railroad service on September 1, 1924, on the staff of the Atlantic Coast Line, serving until August, 1925, as rodman and instrumentman. On the latter date he became assistant engineer of the Florida Railroad & Navigation Corporation (now part of the Atlantic Coast Line), leaving the employ of that organization on January 1, 1926, to become assistant chief engineer of the Empire State Development Company at Albany, Ga. On April 1, 1926, he became assistant engineer of the Jacksonville Terminal Company, and on May 15, 1926, he was appointed an instrumentman on the Florida East Coast. From December 1, 1926, to June 15, 1927, Mr. McDiarmid served as field engineer of the Guatemala division of the United Fruit Company at Guatemala, Central America. On July 15, 1927, he became a draftsman on the Georgia & Florida, and subsequently served that road successively as instrumentman, resident engineer, supervisor of bridges and buildings, principal assistant engineer and assistant chief engineer. Mr. McDiarmid was holding the latter position at the time of his recent promotion to chief engineer.

Tom A. Blair, chief engineer of the Western lines of the Atchison, Topeka & Santa Fe, with headquarters at Amarillo, Tex., has been promoted to the newly created position of assistant chief engineer, system, with headquarters at Chicago, and **Joseph A. Noble,** district engineer of the Southern district, Western lines, has been advanced to chief engineer of the Western lines, with headquarters as before at Amarillo, succeeding Mr. Blair. A photograph and biography of Mr. Noble were published in the August

Tom A. Blair

issue, of *Railway Engineering and Maintenance,* following his promotion to district engineer at Amarillo, effective June 8.

Mr. Blair was born at DeBeque, Colo., on June 1, 1892, and graduated in civil engineering from the University of Colorado in 1913. He taught structural engineering at his alma mater for a time before entering railway service in 1915 as a rodman on the Santa Fe at Pueblo, Colo. In 1916 he was promoted to office engineer at Shattuck, Okla., and during World War I he served with the U. S. Army overseas as a first lieutenant with the 115th Engineers, afterward returning to the Santa Fe as office engineer at Shattuck. He then served successively as a building inspector on the Plains division, roadmaster at Pueblo, and in 1926 he was promoted to assistant engineer of the Plains division. Mr. Blair was advanced to division engineer of the Slaton division of the Panhandle & Santa Fe in 1927, with headquar-

(Continued on page 796)

ters at Slaton, Tex., and in 1929 he was transferred to the construction department, working on the Orient extension, subsequently being appointed division engineer at Pueblo. In the summer of 1936, he was promoted to trainmaster, serving in that capacity at Slaton, and later at Wellington, Kan., and on August 1, 1937, he was advanced to district engineer at La Junta. Mr. Blair was promoted to chief engineer of the Western lines, with headquarters at Amarillo, in July, 1938, which position he held until his recent promotion.

William S. McFetridge, principal assistant engineer of the Bessemer & Lake Erie, has been promoted to consulting engineer, with headquarters as before at Greenville, Pa. **J. W. Hopkins,** track supervisor at Greenville, has been advanced to principal assistant engineer, with the same headquarters, succeeding Mr. McFetridge.

Mr. McFetridge was born at Oil City, Pa., on September 10, 1873, and attended Lafayette College, Easton, Pa. He entered railroad service in June, 1892, as a clerk in the car service department of the Pittsburgh, Shenango & Lake Erie (now the B. & L. E.), later serving as assistant engineer, with headquarters at Greenville. He subsequently served as assistant engineer of the Pittsburgh & Conneaut Dock Company, chief engineer and superintendent of the Parral & Durango in Mexico, assistant chief engineer of the Little Kanawa Syndicate Lines, with headquarters at Parkersburg, W. Va., locating engineer of the Western Allegheny at New Castle, Pa., chief engineer and treasurer of the Dome Lake Reservoir Company, Sheridan, Wyo., engineer of construction of the Northern Maine Seaport (now the Bangor & Aroostook), LaGrange, Me., and engineer of the Conneaut Lake Park Company, Exposition Park, Pa. In October, 1909, Mr. McFetridge returned to the B. & L. E., as assistant engineer at Greenville, and was promoted to valuation engineer in 1913. Four years later he was advanced to the position he held at the time of his new appointment.

Mr. Hopkins was born on November 13, 1903, and attended Lehigh University and Pennsylvania State College, graduating in civil engineering from the latter institution in 1925. In June of the same year he became a designer and field engineer for J. B. Long, consulting engineer, Norristown, Pa., and in April, 1926, he was appointed construction superintendent for Just & Betteridge, Miami, Fla. In 1927 Mr. Hopkins returned to the J. B. Long organization as designer and field engineer and in November, 1930, he became a bridge designer for the Pennsylvania Department of Highways, with headquarters at Harrisburg, Pa. In July, 1931, he was promoted to division bridge engineer, with headquarters at Franklin, Pa. In November, 1936, Mr. Hopkins entered railway service as a designing engineer on the B. & L. E., with headquarters at Greenville, and in June, 1939, he was appointed to the position he held at the time of his new promotion.

Charles U. Kitzmiller, an instrumentman on the Panhandle division of the Chicago, Rock Island & Pacific, with headquarters at Liberal, Kan., has been promoted to special engineer in charge of flood control, with headquarters at Chicago, succeeding **James Erskine,** whose death on September 2 is reported elsewhere in this issue.

Track

J. A. Toliver, roadmaster on the first district of the Pecos division of the Atchison, Topeka & Santa Fe at Clovis, N.M., has been transferred to the Panhandle division, with headquarters at Wellington, Kan., succeeding **J. E. Emond,** who has been transferred to Clovis, replacing Mr. Toliver.

W. R. Johnson has been appointed roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at Stockton, Cal., succeeding **K. K. Rogers,** who has been appointed track supervisor at Visalia, Cal.

W. R. Payne, track supervisor on the Missouri Pacific, has been promoted to roadmaster of the Wichita division, with headquarters at Wichita, Kan., succeeding **E. L. Anderson,** who has been transferred to Joplin, Mo.

F. E. Dauner, assistant roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at Harper, Kan., has been transferred to Alva, Okla., with jurisdiction over the First district.

Joseph H. Mercer has been appointed assistant supervisor of track of Subdivision 14 of the Buffalo division of the New York Central, with headquarters at Lackawanna, N.Y., to succeed **John V. Middleton,** whose appointment as assistant division engineer at New York is noted elsewhere in these columns.

J. L. Turner, section foreman of the Illinois Central at Blairsburg, Iowa, has been promoted to track supervisor, with headquarters at Waterloo, Iowa, succeeding **W. N. Rice,** whose promotion to assistant engineer of the Iowa division, with headquarters at Waterloo, is reported elsewhere in this issue.

R. A. Hostetter, assistant roadmaster on the Southern Pacific Lines in Texas and Louisiana, has been promoted to roadmaster, with headquarters as before at Austin, Tex., succeeding **R. C. Corley,** who has been transferred to Giddings, Tex., relieving **W. P. Hesterly,** who has been transferred to Ennis, Tex., replacing **R. M. Purdue,** whose death is reported elsewhere in this issue.

A. B. Simmons has been appointed roadmaster of the Second track district of the Missouri & Arkansas, with headquarters at Leslie, Ark., succeeding **Sperlin Shelton,** who has been transferred to the First track district, with headquarters at Harrison, Ark. Mr. Shelton replaces **A. Terry,** who has been granted a leave of absence for military service.

Leslie Day, instrumentman on the Belt Railway of Chicago at Chicago, has been promoted to supervisor of track, with headquarters at Clearing, Ill., succeeding **Vincent V. Holmberg,** whose appointment as supervisor of bridges and buildings on the Chicago & Western Indiana was reported in the August issue.

L. R. Deavers, roadmaster of the Missouri-Kansas-Texas at De Leon, Tex., has been transferred to Waco, Tex., succeeding **L. M. Berger,** who has returned to his section at Temple, Tex., because of ill health. **Cecil Robbins** has been appointed roadmaster at De Leon, replacing Mr. Deavers.

J. L. Alter, assistant roadmaster on the Atchison, Topeka & Santa Fe at San Bernardino, Cal., has been promoted to roadmaster, with headquarters at Los Angeles, Cal., succeeding **J. H. Bell,** whose transfer to Fresno, Cal., was reported in the July issue. **E. E. Rury,** track supervisor, has been advanced to assistant roadmaster, with headquarters as before at San Bernardino, replacing Mr. Alter.

W. B. Lee, supervisor of track on the Western Maryland, has been appointed supervisor of work equipment, with headquarters as before at Hagerstown, Md.

A. L. Campbell, roadmaster of the Elko district on the Salt Lake division of the Southern Pacific at Elko, Nev., has been transferred to the Ogden district, with headquarters at Ogden, Utah.

C. Lyman Huggins, supervisor of track on the Atchison, Topeka & Santa Fe, has been promoted to roadmaster, with headquarters as before at Chillicothe, Ill., succeeding **L. J. Riekenberg,** who has been assigned to other duties.

Vivian D. Braley, assistant supervisor of track on the Boston & Maine, with headquarters at Concord, N.H., has been appointed acting track supervisor on the New Hampshire division, with headquarters at Nashua, N.H. **Conrad J. Benson** has been appointed acting assistant track supervisor at Concord to succeed Mr. Braley.

E. F. Snyder, assistant supervisor of track on the Illinois Central at Champaign, Ill., has been promoted to supervisor of track, with headquarters at Bloomington, Ill., succeeding **W. S. Williams,** who has been transferred to Kankakee, Ill., replacing **M. B. Davis,** whose promotion to division engineer, with headquarters at Waterloo, Iowa, is reported elsewhere in these columns.

Levin M. Kuhn, whose appointment as supervisor of track on the Richmond, Fredericksburg & Potomac, with headquarters at Fredericksburg, Va., was announced in the July issue, was born on March 26, 1905, at Richmond, Va. After attending Virginia Mechanics Institute, Mr. Kuhn entered railway service with the R. F. & P. on April 17, 1934, serving until December 1, 1939, as a construction inspector and draftsman. He then served for several years as a track supervisor's clerk. On July 1, 1941, he was promoted to assistant supervisor of track, with headquarters at Richmond, which position he held until his recent promotion to supervisor of track.

R. S. Ward, supervisor of track on the Atchison, Topeka & Santa Fe at Turner, Kan., has been promoted to acting roadmaster on the Eastern division, with headquarters at Topeka, Kan., replacing **E. L. Banion,** who has been promoted to gen-

(Continued on page 798)

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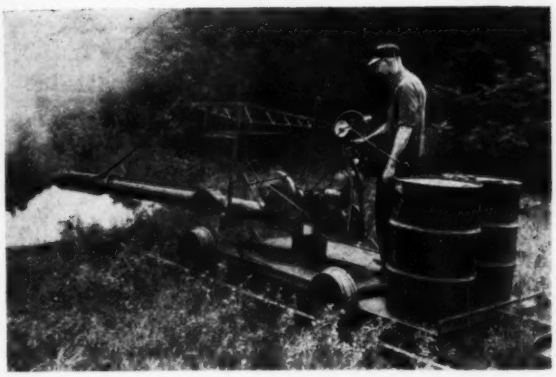
For Early Delivery in 1944

Insure that These Two Labor- and Time-Saving Units Will Work for You Next Year



WOOLERY JUNIOR WEED BURNER Saves Time and Labor Where It Counts—

For the duration, peak traffic will require clean tracks—free of weeds and their harmful effects. Use the Woolery Junior Weed Burner to help you beat the labor shortage. A one-man machine, it burns weeds quickly and thoroughly on and off track, uses a minimum of oil and does the job at lowest cost.

"There's a Reason" why more than 75 railroads are using Woolery Weed Burners.

WOOLERY TIE CUTTERS Push Tie Renewals Through Ahead of Schedules

For next Spring's programs, let the modern Woolery Method of tie renewal help you beat work schedules despite the steadily increasing shortage of labor.

This year Woolery Tie Cutters have saved thousands of manhours by enabling skeleton track gangs to do tie renewal work which formerly required much larger gangs to accomplish—yes, and do it better and more economically too.

Watch a Woolery Tie Cutter at work and you'll realize that it is the machine that you will need for the duration and in the years of peace to come. The Cutter works equally efficient in stone, gravel or other types of ballast—simply saws the tie into three easily-removable pieces, practically eliminates retamping and leaves the tiebed undisturbed for the new tie.

Woolery Tie Cutters and Weed Burners *belong* in your track maintenance budget—they will pay for themselves twice over in a single season in labor saved, in time saved and satisfactory accomplishment.

WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

RAILWAY MAINTENANCE EQUIPMENT

TIE CUTTERS • SWITCH HEATERS • MOTOR CARS

RAILWAY WEED BURNERS • BOLT TIGHTENERS

eral track foreman, with headquarters as before at Topeka, a temporary assignment. In his new position Mr. Banion will have general supervision over all track laying, surfacing and ballasting on the Eastern lines of the road, reporting to the assistant general manager. **Perl Scogin** has been appointed acting roadmaster on the Southern Kansas division, with headquarters at Chanute, Kan., succeeding **C. W. Ayling,** who has been granted leave of absence on account of illness.

James P. Morrissey, whose appointment as track supervisor on the Erie, with headquarters at Dunmore, Pa., was announced in the August issue, was born on February 28, 1903, at Dunkirk, N.Y. Mr. Morrissey attended Cornell university, and later studied civil engineering through the International Correspondence Schools, graduating in 1934. He entered railway service in April, 1927, as a rodman on the Erie, and during the following eight years he served in this capacity and as a levelman and transitman at various points. On January 1, 1935, he was promoted to chief of the engineer corps at Dunmore, Pa., being transferred to Jersey City, N.J., on July 16, 1939. On October 1 of the following year he was further advanced to general yard foreman at Port Jervis, N.Y., which position he held until his recent promotion to track supervisor at Dunmore, Pa.

Glen W. Shafer, section foreman on the Illinois Central at Ft. Dodge, Iowa, has been promoted to supervisor of track, with headquarters at Council Bluffs, Iowa, succeeding **A. A. Witter,** who has been transferred to Carbondale, Ill., replacing **H. J. Hawkins,** assigned to other duties. Mr. Shafer was born at Effingham, Ill., on November 5, 1902, and entered railroad service on August 2, 1919, with the Illinois Central as a trackman at Webster City, Iowa. He subsequently served as section foreman, brakeman and assistant extra gang foreman. In 1929, Mr. Shafer was promoted to section foreman at Cedar Falls, Iowa, and in October, 1930, he was transferred to Iowa Falls, Iowa. In 1935 he was appointed extra gang foreman on the Waterloo and Omaha district and seven years later he was advanced to acting supervisor of track at Ft. Dodge. On June 15, 1943, he was appointed to the position he held at the time of his new promotion.

Bridge and Building

James F. Redmond, general foreman of bridges on the electric division of the New York Central, has been promoted to supervisor of structures of the same division, with headquarters as before at New York, to succeed **E. R. Tattershall,** whose appointment as superintendent of maintenance equipment is noted elsewhere in these columns. **Charles Tinnelly,** bridge foreman, has been appointed general foreman of bridges at New York, to replace Mr. Redmond.

C. R. Richards, assistant supervisor of bridges and buildings of the Boston division of the Boston & Albany, with headquarters at Worcester, Mass., has been promoted to supervisor of bridges and buildings of the same division, with headquarters at Allston, Mass., to succeed **H. H. Farnham,** whose death is reported elsewhere in these columns. **Gifford N. Hartwell,** a bridge inspector, has been promoted to assistant supervisor of bridges and buildings of the Boston division, with headquarters at Worcester, to succeed Mr. Richards.

Special

E. R. Tattershall, supervisor of structures of the Electric division of the New York Central, with headquarters at New York, has been promoted to the newly-created position of superintendent of maintenance equipment of the Lines Buffalo and East, including the Boston & Albany, with the same headquarters.

Obituary

H. H. Farnham, supervisor of bridges and buildings of the Boston division of the Boston & Albany, with headquarters at Allston, Mass., died on August 23.

M. L. Conley, who retired on January 1, 1942, as supervisor of track on the Illinois Central at Freeport, Ill., died recently at the Illinois Central hospital in Chicago.

Edgar L. Conner, general foreman of bridges and buildings on the Plains division of the Atchison, Topeka & Santa Fe, with headquarters at Amarillo, Tex., died at his home in that city on August 1, after an illness of several months.

James Erskine, special engineer in charge of flood control on the Chicago, Rock Island & Pacific, with headquarters at Chicago, died at Kansas City, Mo., on September 2, while on an inspection trip. Mr. Erskine was born at McCutchanville, Ind., on July 24, 1874, and was a graduate of Purdue University. He entered the employ of the Rock Island in 1916 as an inspector in the engineering department, and in the same year he was promoted to assistant engineer. In 1935 Mr. Erskine was advanced to the position he held at the time of his death.

Calvin Oberdorf, who was engineer of construction of the Florida East Coast during its extensive rehabilitation in 1920-30, lost his life in the derailment of the "Congressional Limited" on September 6. Born at Sunbury, Pa., about 55 years ago, Mr. Oberdorf was graduated *summa cum laude* in engineering from Bucknell University about 1908. Thereafter he was engaged in railway location and construction, principally on the Lehigh & New England and Lehigh & Hudson River. He was in the valuation department of the Southern from 1914 to 1919 and was, for a short time, assistant regional director, engineering, Southern region, United States Railroad Administration. Leaving the Florida East Coast in 1930, Mr. Oberdorf went with the valuation department of the Chesapeake & Ohio and in 1933 entered the service of the federal government, where he was engaged continuously up to the time of his death.

Supply Trade News

General

The Cleveland sales office of the **Industrial Brownhoist Corporation,** Bay City, Mich., has been moved from 4403 St. Clair avenue, to Room 1812, Terminal Tower, Cleveland, Ohio.

The **Silent Hoist Winch & Crane Company,** Brooklyn, N.Y., has been granted a renewal of its Army-Navy "E" award for continued high achievement in the production of war material.

Personal

J. J. Topolinski, superintendent of **Skilsaw, Inc.,** Chicago, has been promoted to works manager, succeeding **L. E. Parker,** who has resigned.

John W. Murphy, acting manager of sales, rails and accessories, for the **Bethlehem Steel Company,** has been appointed manager of sales, rails and accessories, to succeed **Howard E. Stoll,** who retired on August 31 after 31 years in that position.

William D. Boldt, Elmhurst, Ill., has been appointed Southeastern division sales engineer of **Templeton, Kenly & Co.,** Chicago, with headquarters at Atlanta, Ga., succeeding **Wilfred C. Cornu,** whose death was reported in the April issue.

At a meeting of the board of directors of the Simmons-Boardman Publishing Corporation on August 18, **Herbert E. McCandless,** assistant to the president in charge of circulation, was elected a vice-president of the company. Mr. McCandless was born in New York City on January 18, 1890. He began his career in 1905 in the banking field in New York City and was with a New York public utility company from 1911 to 1917. From September 10, 1917, until 1919 he served in the U. S. Army, receiving a sergeant's rating on December 1, 1917, and serving with the A.E.F. as dispatch carrier. Since 1920 he has been with the Simmons-Boardman Publishing Corp., of which he has, since 1928, been assistant to the president in charge of circulation.

Herbert E. McCandless

The First Word in Construction
The Last Word in Wear!

"Wood" Brand Track Shovels have won their service stripes for unusual long-time service on the railroads of America. They are the FIRST WORD in heavy duty construction . . . the LAST WORD in long-lasting wear.

THE STEEL I-BEAM HANDLE REINFORCEMENT

An unequalled extra-strength feature which adds a minimum of 30% more strength at the point where 65% of handle breaks occur.

THE Wood SHOVEL AND TOOL COMPANY, Piqua, Ohio

A NATIONAL ORGANIZATION
***SPECIALIZING EXCLUSIVELY* IN SHOVELS, SPADES AND SCOOPS**

On the Desk When Budgets Are Being Prepared

Brings Sales Stories Before Railway Officers Before Decisions Are Made

"Starting Early"

"Boss, the roads are certainly getting started early on their programs for next year," ejaculated the star salesman to his railway sales manager.

"How's that?" asked the sales manager.

"In several offices where I've called the last few days, I've found them making preliminary budgets of the things they want to buy for next year. They're three months ahead of where they used to be at this time of the year."

"How do you account for that?"

"Afraid of difficulty in getting the things they need, I suppose. They're starting early now in the hope they'll beat the other roads."

"You know that's smart, Bill. We ought to encourage it every way we can for it'll help us a lot in planning our production. And it suggests something further to me, too."

"What's that?"

"We've got to step up *our* presentation to them. If they're making up their programs now, we've got to set our advertising schedule in *Railway Engineering and Maintenance* ahead so we can get our story before them before they reach any final decisions."

"That's right, Boss. Now is the time it'll help me most."

"We'll increase our space at once, Bill. I'm glad you spoke of it."

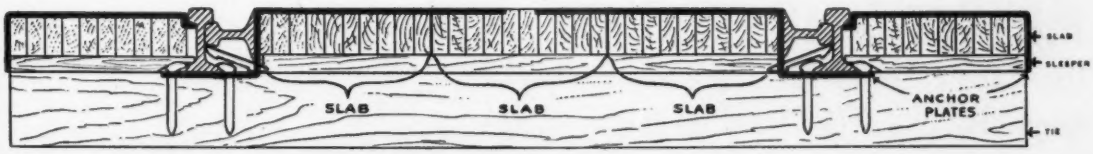
RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

USING A MINIMUM OF CRITICAL MATERIALS

MAKE YOUR *Permanent* INSTALLATIONS NOW

LAMINEX Sectional CROSSING

Made of pressure creosoted wood and LAMINATED into slabs. These slab sections are usually 16¼" wide x 8' or 10' long. Three sections fit between the rails, and one section on each side of the rail as shown in the view below.



View of LAMINEX Crossing being installed on the Rock Island main line. Picture shows a middle section being put in place.

LAMINEX Crossings are anchored to the rails—and join as one unit to the track itself.

Anchor plates hold the slabs in place. In addition to being fastened with lag screws to the ties, they also fasten under the base and flange of the rails.

Consider these 5 Advantages

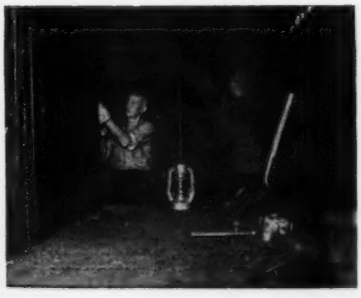
1. **Priced greatly lower than most patented crossings.**
2. **Outwears several ordinary crossings.**
3. **Reduces maintenance cost by half.**
4. **Easily taken up for road bed repairs.**
5. **Easy and quick to install.**

LAMINEX CULVERTS

LAMINEX Culverts are made of LAMINATED and creosoted wood. The ends of the top and bottom sections are made to interlock with the ends of the side sections. (See diagram.)

LAMINEX Culverts meet A.R.E.A. specifications. Made in single, twin, triple, and quadruple openings.

View of LAMINEX Culvert on Rock Island line between the Twin Cities and Des Moines. Installed under 25' fill by tunneling method.



Culverts are sold either ready for installation or completely installed.

NO TRAFFIC INTERRUPTION—can be installed by the tunneling method.

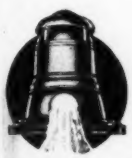
Installation of a culvert by the tunneling method is a decided advantage. With LAMINEX, digging need be done only 15" ahead of actual installation. The small amount of backfilling and tamping required can be easily and thoroughly done.

Write or wire for detailed information.

Wheeler Lumber Bridge & Supply Co.

Hubbell Bldg., Des Moines, Iowa

THREE FULLY PROVEN FEATURES



The post-war era may be years—or only a few short months away. The tides of battles and Nations are running faster and faster. Peace may fall upon us with a shattering suddenness. In the less hurried days of peace, the buying of machinery and equipment is sure to be upon a more keenly exacting basis. It is then that Layne's three great and fully proven features—Quality, Efficiency and Reliability, will reach new heights of appreciation.

Building Turbine Pumps and Well Water Systems requires skill, patience, knowledge and experience. In all of these attributes, Layne leads the world. That leadership is today, and has long been many times greater than that of any competitor. Such a record cannot be discounted.

Layne Turbine Pumps and Well Water Systems are built with the utmost precision and from the world's finest and most practical materials. They offer the highest in efficiency, longest years of life, lowest upkeep cost and the most reliable service.

For illustrated literature, address Layne & Bowler, Inc. General Offices, Memphis 8, Tennessee.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. * Layne-Central Co., Memphis, Tenn. * Layne-Northern Co., Mishawaka, Ind. * Layne-Louisiana Co., Lake Charles, La. * Louisiana Well Co., Monroe, La. * Layne-New York Co., New York City * Layne-Northwest Co., Milwaukee, Wis. * Layne-Ohio Co., Columbus, Ohio * Layne-Texas Co., Houston, Texas * Layne-Western Co., Kansas City, Mo. * Layne-Western Co. of Minnesota, Minneapolis, Minn. * International Water Supply, Ltd., London, Ontario, Canada.

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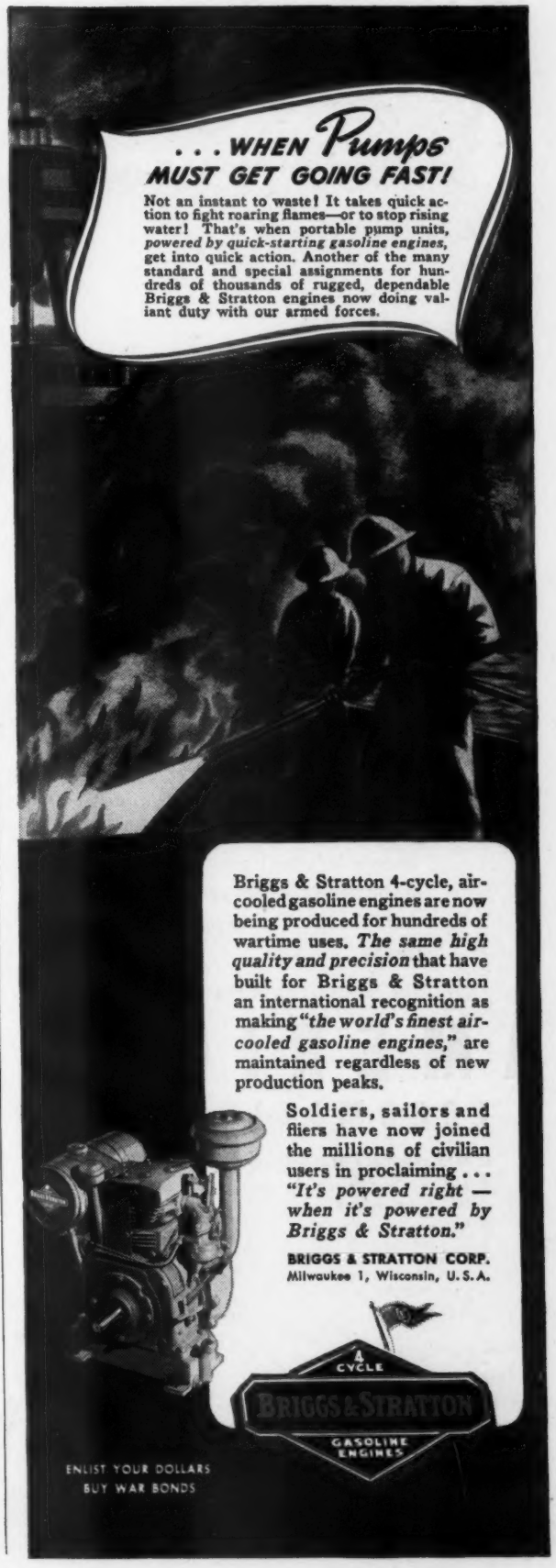
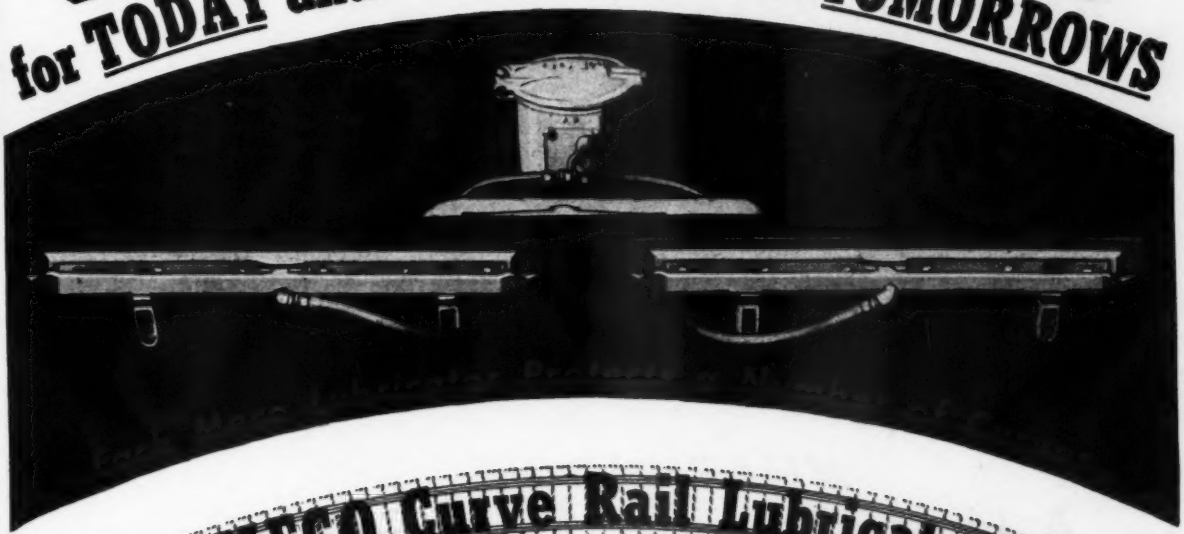
WELL WATER SYSTEMS
DEEP WELL PUMPS

Builders of Well Water Systems for Every Municipal and Industrial Need



Higher Train Speeds, Lower Costs for TODAY and for Thousands of TOMORROWS

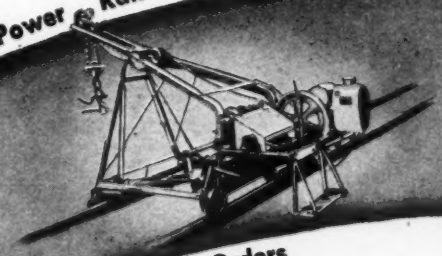


MECO Curve Rail Lubricators

Mecos make higher train speeds possible with safety. They double to quadruple the *remaining* life of *present* rails—and the life of future new curve rails, too!

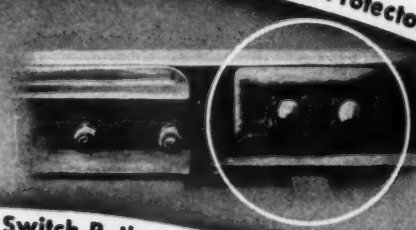
LET US ANALYZE YOUR CURVE TERRITORY CHARTS AND SUGGEST ECONOMICAL LUBRICATION

Power Rail Layer



Requires No Train Orders

Mack Switch Point Protectors

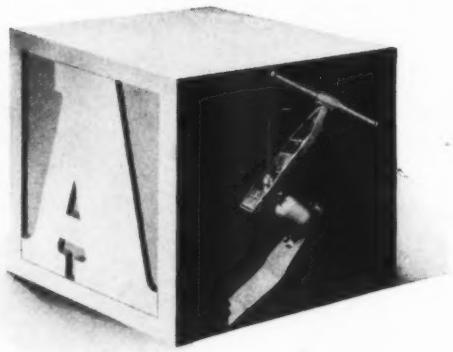


Make Switch Rails Last 8 to 10 Times Longer

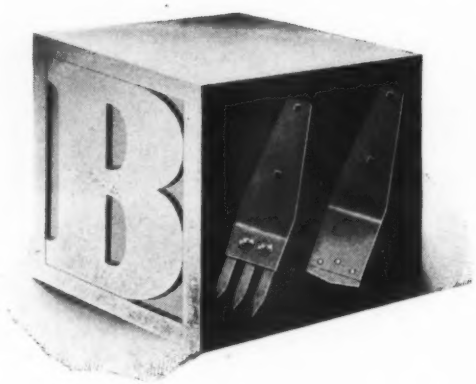
Maintenance Equipment Company

RAILWAY EXCHANGE BUILDING • CHICAGO, ILLINOIS

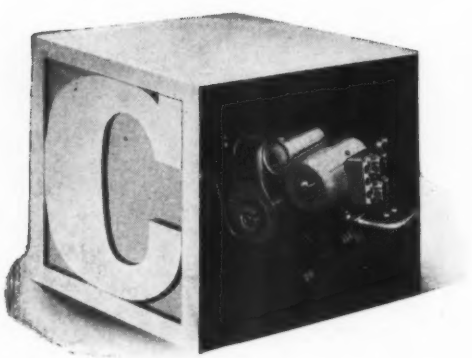
The A-B-C's of Tamping



Good track tamping is as fundamental as A-B-C and exactly as simple, especially when track maintenance equipment includes the sturdy and economical JACKSON Universal Tie Tamper. Road masters, supervisors of track and section foremen, who are acquainted with the JACKSON tamper will vouch for this fact.



Six interchangeable tamping blades are an outstanding feature of JACKSON tamping equipment. In any lift and all ballast these blades are unequalled in organizing ballast under ties.



Operating two or four JACKSON vibratory Tampers, anywhere, any time, the JACKSON WS-4 Portable Power Plant offers flexibility and adaptability as a power source. It is indispensable for flood lighting during emergencies. Based on its wide-range power application, the WS-4 is a profitable maintenance investment.

***A**—JACKSON Universal Tamper, **B**—Tamper Interchangeable Blades, **C**—Portable Power Plant, offer procurement officials a track maintenance combination that has no parallel in operating economy, or dependable performance. Efficient in all lifts and any ballast when speed, uniformity and firmness of tamping is required. For complete details write for new "Fighting Freight" bulletin and "JACKSON Tampers — How to Use and Maintain Them."*

ELECTRIC TAMPER & EQUIPMENT CO., LUDINGTON, MICH.

JACKSON Tampers

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Bridges, all kinds; Compromise Joints; Flangeway Guards; Frogs; Gage Rods; Guard Rails; Guard Rail Clamps; Heat-Treated Rail Crossings; Heel Blocks; Insulated Rail Joints; Manganese Track Work; Mayari Steel Frog, Track and Fitting-up Bolts; Nuts; Rail Braces; Rail Anchors; Rail Joints; Rails, Girder and Tee; Rivets; Spikes; Steel Plates and Shapes; Steel Ties; Steel Frame Trestles, Viaducts, etc.; Structural Steel; Switches; Switch Heaters; Switch Stands and Fixtures; Tie Plates.

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Gasoline Engines.

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Track Supplies; Diesel and Gasoline Motor Cars; Earth Drills; Hand and Push Cars; Lifting Jacks; Track Drills; Bonding Drills; Wheels; Rail Benders; Crossing Gates; Tie Nippers; Wrecking Frogs; Frogs and Switches; Gauges and Levels; Industrial Shop Trucks; Track Liners; Bumping Posts and Car Stops; Generator Sets.

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Pre-Fabricated Structures.

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Axles; Cars, Ballast Drainage, Derrick, Extinguisher, Extra Gang, B & B, Inspection Motor, Push, Section Motor; Motor Car Engines; Mowers; Roller Axle Bearings, Trailers; Weed Burners; Wheels.

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See Worthington Pump & Machinery Corporation.

Hubbard & Co., (Tool Division) 732
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Air Compressors; Air Hoists; Air Lift Pumping System; Centrifugal Pumps; Chipping Hammers; Compressors; Condensers; Hammers, Chipping, Calking, Riveting; Rock Drills; Hose; Pavement Breakers; Pneumatic Tools; Portable Grinders; Rail Bonding Outfits; Spike Drivers; Tie Tampers and Tie Tamper Compressors.

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Asbestos-Cement Water Pipe, Electrical Conduit and Smoke Jacks; Corrugated and Flat Asbestos Sheets; Asbestos and Asphalt Roofing and Shingles; Insulating Board; Building Insulation; Boiler and Pine Insulation; Packings; Refractory Cements; Asphalt Tile Flooring; Acoustical Treatment.

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East Chicago, Indiana.
Ballast Spreaders; Ballast Shapers; Bank Builders; Bank Slopers; Cars, Spreader; Ditchers; Ice Cutters; Snow Plows.

Kalamazoo Railway Supply Co. 726
Kalamazoo, Mich.
Cars, Derrick, Discing, Hand, Motor, Push, Section, Inspection; Cattle Guards; Drills, Track; Engines, Gasoline; Gages, Track; Gates, Crossing; Jacks, Track, Bridge; Levels, Track; Rail Saws, Portable Wheels, Motor & Hand Car.

Layne & Bowler, Inc. 805
Memphis, Tennessee.
Turbine Pumps; Water Supply Contractors; Well Systems.

Le Tourneau, Inc. 810
Peoria, Illinois.
Carryall Scrapers; Angledozers; Bulldozers; Rooters; Power Control Units; Tractor Cranes; Pushdozers; Sheep's Foot Rollers; Towinapulls.

Link Belt Speeder Corporation 739
301 West Pershing Road, Chicago 9, Illinois.
Off-Track Equipment; Crawler and Wheel-Mounted Cranes; Shovels and Draglines.

Lufkin Rule Co., The 811
Saginaw, Michigan.
Gages, Measuring; Rules; Scales, Steel Measuring; Tapes, Measuring; Micrometers; Tools, Machinists.

Lundie Engineering Corporation, The 802
19 West 50th St., New York City.
Tie Plates; Rail and Flange Lubricators; Spring Rail Clips; Tongs.

Maintenance Equipment Company 806-807
80 East Jackson Blvd., Chicago, Illinois.
Curve Rail and Flange Lubricators; Reversible Switch Point Protectors; Rail Layers, Hand and Power; Friction Car Stops; Universal Portable Derails.

Mall Tool Company.....725
7746 So. Chicago Ave., Chicago, Illinois.
Bridge and Building Machines; Concrete Vibrators and Surfacers; Cross Slotters; Drills, Wood Boring; Flexible Shaft Grinders and Polishers; Gasoline Engine and Electric Dirlls; Gasoline Engine and Air Chain and Circular Saws; Rail Grinders; Grinders for Signal Bond work.

Morden Frog and Crossing Works.....808
8 So. Michigan Ave., Chicago, Illinois.
Articulated Crossings; Balkwill Crossings; Compromise Joints; Frogs; Security Track Designs; Gage Rods; Guard Rails; Rail Braces; Switches.

Morrison Railway Supply Corp......710
1437-1439 Bailey Ave., Buffalo, New York.
Frog and Crossing Repairs; Bridge Repairs; Bridge Cleaning and Painting; Rail Welding; Steel Fabrication; Switch Point Guards; Welded Steel Pile Shoes; Wood Preservation.

Moss Tie Company, T. J......720
Security Building, St. Louis 2, Missouri.
Creosoted Black Gum Sectional Crossings; Creosoted Ties; Treated Lumber; Treated Poles.

National Lock Washer Company, The.....815
Newark, New Jersey.
A complete line of railway Spring Washers.

Nordberg Mfg. Co......723
Milwaukee, Wisconsin.
Adzing Machines; Compressors; Crushers, Engines, Diesel and Steam; Mine Hoists; Power Jacks; Rail Drills; Rail Grinders; Screens; Spike Pullers; Track Shifter; Track Wrenches; Underground Shovels; Special Machinery.

Oliver Iron and Steel Corporation.....717
South Tenth and Muriel Streets, Pittsburgh, Pennsylvania.
Carriage Bolts; Conecting Rod Bolts; Flush Head Bolts; Frog and Crossing Bolts; Key Bolts; Lag Bolts; Machine Bolts; Stud Bolts; Switch Bolts; Track Bolts; Trestle Bolts; Water Tight Bolts; Cold Punched, Hot Pressed and Semi Finished Nuts; Rivets, Steel, Boiler, Structural; Gage Rods; Screw Spikes; Spring Rods; Rail Clips; Construction Material; Pole Line Hardware.

Onan & Sons, O. W......810
3100 Royalston Ave., Minneapolis, Minn.
Electric Generating Plants.

Oxweld Railroad Service Company, The.....698-699
230 No. Michigan Ave., Chicago, Illinois.
Acetylene Appliances; Acetylene, Dissolved; Joint Bar Reconditioning Equipment, Calcium Carbide; Carbide Lamps; Flame Cleaning Equipment; Floodlights; Frog and Crossing Reconditioning Equipment; Generators, Acetylene; Hard-Facing Materials; Oxygen; Oxy-Acetylene Cutting and Welding Equipment; Pressure Rail Butt-Welding Service; Rail Bonding Equipment; Rail End Hardening Equipment; Rail Reconditioning Equipment; Rail Welding Equipment; Switch Point Reconditioning Equipment; Blowpipes for Oxy-Acetylene Cutting, Welding and Heat Treating; Welding Rods and Supplies.

P. & M. Co., The 695
80 East Jackson Boulevard, Chicago, Illinois.
Bond Wire Protectors; Rail Anchors; Rail Anti-Creepers.

Pittsburgh Pipe Cleaner Co......728
433 Melwood Street, Pittsburgh, Penna.
Hydraulic Pipe Cleaning Tool.

Portland Cement Association.....708
33 W. Grand Ave., Chicago, Illinois.
Information oif concrete track support; concrete piles and pile trestles; other uses of Portland cement concrete.

Porter Company, Inc., H. K......802
See Quimby Pump Company, Incorporated.

Q. & C. Co., The.....804
90 West St., New York City.
Anti-slip Rail Tongs; Car Replacers, Compromise Joints; Derails; Electric Snow Melters; Flangeway Brackets; Foot and Heel Guards; Gage Rods; Gaging Tools; Guard Rail Clamps; Insulated Rail Joints; One Piece Manganese Guard Rails; Rail Benders; Skid Shoes; Snow Flangers and Plows; Rail and Flange Lubricator; Switch Point Guards; Wheel Stops.

Quimby Pump Company, Incorporated.....802
Pittsburgh 1, Pennsylvania.
Centrifugal Pumps; Chemical Pumps; Rotex Pumps; Screw Pumps.

Racine Tool and Machine Co......727
1738 State Street, Racine, Wisconsin.
Metal Cutting Machines for production and general purpose cutting; Band Saws; Oil Hydraulic Variable Volume Pumps; Oil Hydraulic 4-Way Valves; Hydraulic Pressure Boosters; Rail Cutters; and special Metal Cutting Machines.

Rail Joint Company, Inc., The.....721
50 Church Street, New York City.
Standard, Compromise, Insulated Joints; Fibre Renewals.

Railroad Accessories Corporation.....741
137 East 42nd Street, New York City.
Drills, Rail; Power Bolting Machine; Power Track Machine; Screw Spiking Machine; Tie Boring Machine.

Rails Company, The.....816
New Haven, Connecticut.
Compression Rail Fastenings; Compression Screw Spikes; Snow Melters; Flange and Curve Rail Lubricators; Foot and Heel Switch Guards, Full Throated Cut Spikes; Interlocking Flangeway Brackets; M & L Track Construction; Wheel Stops and Skid Shoes; Spring Spikes; Automatic Safety Switch Lock; Strip weld process-Rebuilding battered rail ends.

Railway Maintenance Corporation.....713
Pittsburgh, Pennsylvania.
Moles, Ballast Cleaning; Rail Joint Lubricators; Track Derrick, Demountable; Plastic Rail Joint Packing.

Railway Track-work Co......810
3132-48 East Thompson Street, Philadelphia, Pennsylvania.
Abrasives; Cross Grinders; Rail Grinders; Rail Drills; Rail Grinding Wheels and Blocks; Track Grinders.

Ramapo Ajax Division.....735
230 Park Avenue, New York 17, N.Y.
Crossings; Frogs; Gage Rods; Guard Rails; Guard Rail Clamps; Guard Rail Plates; Manganese Track Work; Rail Braces; Rail Lubricators; Switches; Switch Point Locks; Switchstands and Fixtures.

Reliance Spring Washer Division.....696
Massillon, Ohio.
See Eaton Mfg. Co.

Robinson Clay Products Co......736
Arkon, Ohio.
Clay Pipe; Fittings.

Schramm, Inc......742
West Chester, Pennsylvania.
Self-Propelled Crawler or Rail Car Compressor, Gasoline or Diesel Powered.

Simmons-Boardman Publishing Corp......800
105 West Adams St., Chicago, Ill.
Books; Cyclopedias; Publications.

Skilsaw, Inc......809
5053 Elston Avenue, Chicago, Illinois.
Portable Electric Drills; Portable Electric Hand Saws; Portable Electric Grinders; Portable Electric Belt Sanders

Snow Construction Co., T. W......718
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Stanley Electric Tool Division.....803
160 Elm Street, New Britain, Connecticut.
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Teleweld, Inc......730
Railway Exchange Building, Chicago, Illinois.
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Templeton, Kenly & Co......811
1020 So. Central Ave., Chicago, Illinois.
Jacks, Track; Rail Pullers & Expanders, Tie Spacers, Claw Bar Safety Shield and Hand Guards.

Timber Engineering Company.....704
Washington, D.C. & Portland, Oregon.
Timber Joint Connectors—split rings, toothed rings, clamping plates, clase plates, shear plates, spike grids; Grooving Tools; Termite Shields.

Timken Roller Bearing Company, The.....729
Canton, Ohio.
Bearings, Journal Box, Locomotive, Passenger Car, Section Car, Tapered Roller; Thrust; Steel, Alloy, Electric Furnace, Open Hearth, Special Analysis; Tubes, Seamless Steel, Superheater.

Union Carbide & Carbon Corp......698-699
30 East 42nd St., New York City.
See Oxweld Railroad Service Co.

Union Metal Manufacturing Co., The.....711
Canton, Ohio.
Pile Tubing; Steel Casings.

Unit Rail Anchor Company, Inc......733
6301 Butler Street, Pittsburgh 1, Pennsylvania.
Anchors, Rail; Rail Anchors.

Warren Tool Corporation.....734
Warren, Ohio.
Adzes, Claw Bars, Lining and Tamping Bars, Flatters, Rail Forks, Rail Tongs, Sledges and Hammers; Spike Mauls, Spike Pullers, Clay and Tamping Picks, Tie Plug Punches, Tie Tongs, Track Chisels, Track Punches, Wrenches.

Wheeler Lumber Bridge & Supply Co......801
Des Moines, Iowa.
Sectional Railroad Crossings, Wood; Culverts, Wood.

Williams & Co., J. H......707
Buffalo, New York.
Drop-Forged Wrenches (Carbon and Alloy), Detachable Socket Wrenches, Reversible Ratchet Wrenches, Tool Holders, "C" Clamps, Lathe Dogs, Eye Bolts, Hoist Hooks, Thumb Nuts and Screws, Chain Pipe Tongs and Vises, etc.

Wood Shovel & Tool Co., The.....799
Piqua, Ohio.
Track Shovels, Spades and Scoops.

Woodings Forge & Tool Co......731
Verona, Pennsylvania.
See Woodings-Verona Tool Works.

Woodings-Verona Tool Works.....731
Verona, Pennsylvania.
Rail Anchors; Special Alloy and Carbon Nut Locks; Track Tools; Fixed Tension Triflex Spring.

Woolery Machine Company.....797
29th & Como Ave., S. E. Minneapolis, Minnesota.
Railway Weed Burners; Tie Cutters; Creosote Sprayers; Rail and Joint Oilers; Motor Cars.

Worthington Pump & Machinery Corporation.....715
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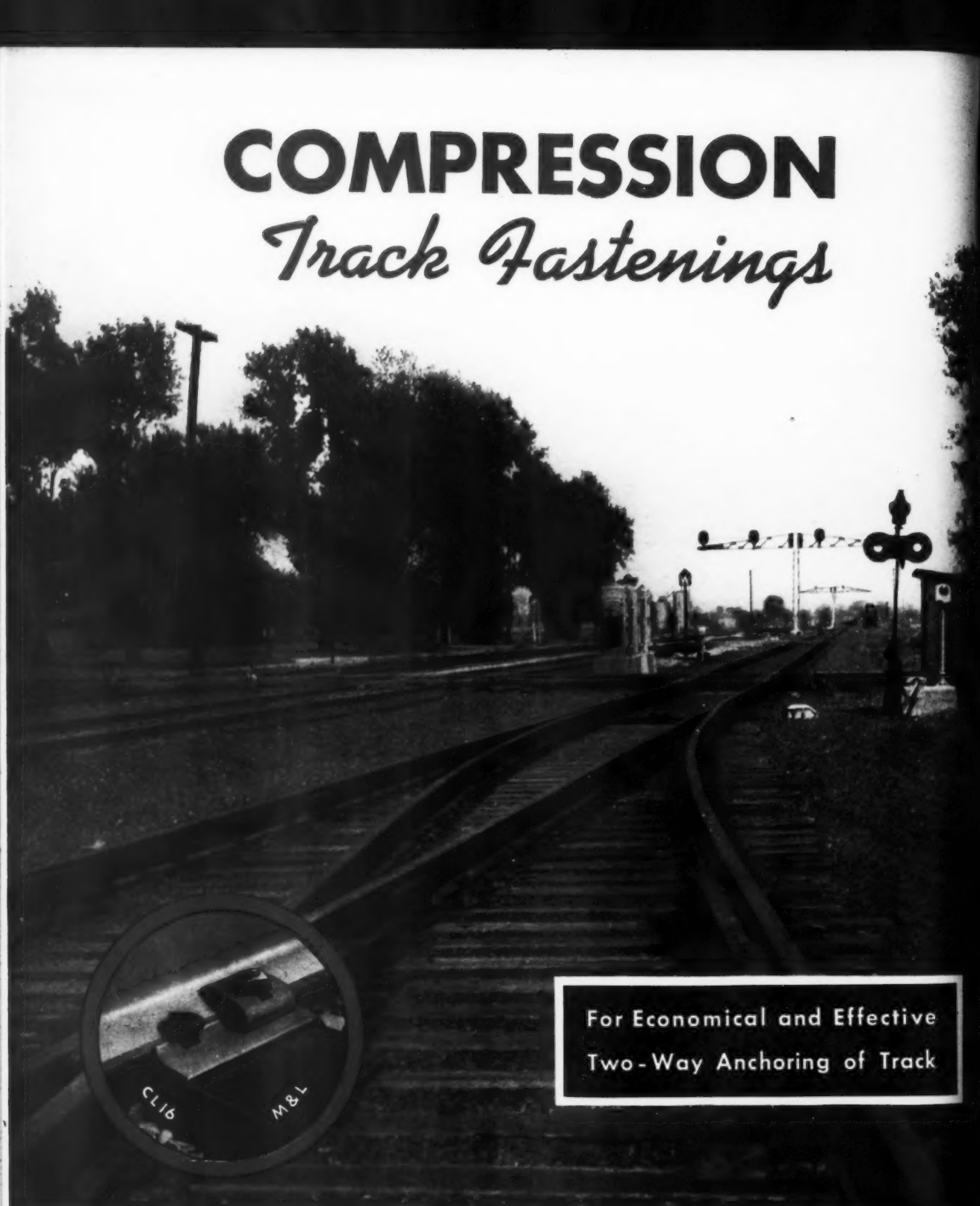

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